

**DOE M 413.3-X**

Approved: XX-XX-XX  
Sunset Review: XX-XX-XX  
Expires: XX-XX-XX

**DRAFT**

# **PROGRAM AND PROJECT MANAGEMENT MANUAL**

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**U.S. DEPARTMENT OF ENERGY  
Office of Management, Budget and Evaluation**

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All Departmental Elements**

**INITIATED BY:  
Office of Engineering and  
Construction Management**

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## PROGRAM AND PROJECT MANAGEMENT MANUAL

1. **PURPOSE.** This Manual provides the detailed requirements and guidance for the implementation of Department of Energy (DOE) Policy 413.1, *“Program and Project Management for the Planning, Programming, Budgeting, and Acquisition of Capital Assets”*; and Office of Management and Budget (OMB) Circulars: A-11, Part 3, *“Planning, Budgeting, and Acquisition of Capital Assets”*; A-109, *“Major Systems Acquisitions”*; A-123, *“Management Accountability and Control”*; A-127, *“Financial Management Systems”*; and A-130, *“Management of Federal Information Resources.”*
2. The requirements identified in this Manual are mandatory for all DOE projects and National Nuclear Security Administration (NNSA) projects having an expected Total Project Cost (TPC) greater than \$5 million.
3. **SUMMARY.** This Manual is composed of 11 chapters that provide the requirements for implementing program and project management within the Department. Chapter 1 is a summary overview of DOE’s acquisition management system for programs and projects. Chapter 2, *“Requirements and Responsibilities,”* identifies all requirements, roles and responsibilities, and establishes approval authorities and change control thresholds. Chapter 3 provides the processes for integrating safety, environmental, quality, and safeguards and security into projects. Chapters 4 through 7 discuss the major acquisition phases and Chapters 8, 9, 10, and 11 provide guidance on acquisition performance baseline, risk management, performance measurement, reviews and reporting, evaluations, and project controlling.
4. **REFERENCE.** DOE P 413.1, *“Program and Project Management for the Planning, Programming, Budgeting, and Acquisition of Capital Assets”*; and DOE O 413.3, *“Program and Project Management for the Acquisition of Capital Assets.”*
5. **CONTACT.** Questions concerning this Manual should be addressed to the Office of Engineering and Construction Management at (202) 586-1784.

Spencer Abraham  
Secretary of Energy

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# PROGRAM AND PROJECT MANAGEMENT

## TABLE OF CONTENTS

<b>1.0 ACQUISITION MANAGEMENT SYSTEM OVERVIEW .....</b>	<b>1-1</b>
1.1 Fundamental Principles .....	1-1
1.2 Acquisition Management System .....	1-2
1.2.1 Initiation .....	1-2
1.2.2 Definition.....	1-3
1.2.3 Execution.....	1-3
1.2.4 Transition/Closeout .....	1-3
1.3 Program and Project Taxonomy .....	1-4
1.3.1 Programs .....	1-5
1.3.2 Projects.....	1-5
1.4 Planning, Programming, and Budgeting System.....	1-6
1.5 Risk Management .....	1-7
1.6 Integrated Project Team.....	1-7
<b>2.0 REQUIREMENTS AND RESPONSIBILITIES .....</b>	<b>2-1</b>
2.1 Requirements and Process Flow.....	2-2
2.3 Authorities, Decisions, and Responsibilities .....	2-4
2.3.1 Critical Decisions .....	2-5
2.4 Roles and Responsibilities.....	2-7
2.4.1 Deputy Secretary .....	2-8
2.4.2 Under Secretary for Energy, Science and Environment and the Administrator for NNSA shall: .....	2-8
2.4.3 Program Assistant Secretaries, including the Deputy Administrators for NNSA, Program Directors, and Others Reporting at this Level shall:.....	2-9
2.4.4 Program Manager shall: .....	2-9
2.4.5 Project Management Support Office shall: .....	2-10
2.4.6 Operations/Field Office Manager/Field Managers for NNSA Operations shall: .....	2-10
2.4.7 Project Manager shall:.....	2-11
2.4.8 Integrated Project Team shall:.....	2-11
2.4.9 Office of the Chief Information Officer shall: .....	2-12
2.4.10 Office of Management, Budget and Evaluation shall: .....	2-12
2.5 Energy Systems Acquisition Advisory Board .....	2-13
2.5.1 Non-Major System Project Advisory Boards .....	2-13

2.5.2 Advisory Boards for Delegated Projects .....	2-13
2.6 Change Control.....	2-14
2.7 References, Other Requirements, and Appendices .....	2-15
<b>3.0 INTEGRATED SAFETY, ENVIRONMENTAL, QUALITY</b>	
<b>ASSURANCE, AND SAFEGUARDS AND SECURITY .....</b>	<b>3-1</b>
3.1 Safety .....	3-1
3.1.1 Integrated Safety Management System .....	3-2
3.1.2 Integrated Safety Management Through Design.....	3-3
3.1.3 ISMS Implementation for Project Management Activities .....	3-7
3.1.4 Safety Documentation and Project Support .....	3-9
3.2 Environment .....	3-10
3.2.1 Background .....	3-11
3.2.2 Environmental Protection and Compliance.....	3-11
3.3 Quality Assurance.....	3-13
3.3.1 Quality Assurance Program.....	3-16
3.3.2 Quality Assurance Program Requirements .....	3-16
3.3.3 Program Development.....	3-16
3.3.4 Implementation.....	3-17
3.4 Source Documents .....	3-18
3.5 Safeguards and Security .....	3-18
<b>4.0 INITIATION .....</b>	<b>4-1</b>
4.1 Mission Need Statement.....	4-1
4.2 Mission Need Statement and Justification Format and Content.....	4-2
4.3 Critical Decision-0, Mission Need Statement Approval .....	4-4
4.4 Project Manager and the Integrated Project Team .....	4-4
<b>5.0 DEFINITION .....</b>	<b>5-1</b>
5.1 Conceptual Design.....	5-1
5.1.1 Requirements Analysis.....	5-1
5.1.2 Conceptual Design Report.....	5-4
5.2 Acquisition Strategy .....	5-6
5.2.1 Acquisition Strategy Format .....	5-8
5.2.2 Submission of the Acquisition Strategy .....	5-13
5.3 Risk Management Plan.....	5-14
5.4 Systems Engineering and Value Management Planning .....	5-14
5.4.1 Systems Engineering .....	5-14
5.4.2 Value Management Program.....	5-15
5.5 Project Engineering and Design Funds .....	5-17
5.5.1 Project Engineering and Design Funding Requests .....	5-17

5.6 Critical Decision-1, Approve System Requirements and Alternatives .....	5-18
5.7 Project Execution Plan.....	5-19
5.8 Reporting .....	5-21
<b>6.0 EXECUTION .....</b>	<b>6-1</b>
6.1 Project Execution.....	6-1
6.2 Preliminary Design .....	6-2
6.3 Critical Decision-2, Approve Acquisition Performance Baseline .....	6-2
6.4 Final Design.....	6-3
6.5 Critical Decision-3, Authorization to Implement .....	6-3
6.6 Implementation/Construction .....	6-4
6.7 Project Management Support Systems .....	6-5
<b>7.0 TRANSITION/CLOSEOUT.....</b>	<b>7-1</b>
7.1 Checkout, Testing, and Commissioning.....	7-2
7.1.1 Checkout.....	7-2
7.1.2 Testing and Commissioning.....	7-2
7.2 Knowledge Transfer .....	7-3
7.3 Documentation.....	7-3
7.4 Lessons Learned .....	7-4
7.5 Logistics.....	7-4
7.6 Readiness Reviews .....	7-4
7.7 Critical Decision-4, Approve Transition and Turnover.....	7-5
7.7.1 Prerequisites for Critical Decision-4 .....	7-5
7.7.2 Post Critical Decision-4 Activities .....	7-5
7.8 Project Closeout.....	7-6
7.8.1 Demobilization .....	7-6
7.8.2 Administrative and Financial Closeout .....	7-6
7.8.3 Closeout.....	7-7
<b>8.0 ACQUISITION PERFORMANCE BASELINE .....</b>	<b>8-1</b>
8.1 Acquisition Performance Baseline Content.....	8-2
8.1.1 Key Performance Parameters .....	8-2
8.1.2 Schedule Parameters.....	8-3
8.1.3 Cost Parameters .....	8-4
8.1.4 Scope Parameters .....	8-4
8.2 Acquisition Performance Baseline Preparation .....	8-4
8.3 Acquisition Performance Baseline Breach .....	8-7
<b>9.0 RISK MANAGEMENT.....</b>	<b>9-1</b>
9.1 Process .....	9-2

9.1.1 Risk Awareness .....	9-4
9.1.2 Risk Identification .....	9-5
9.1.3 Risk Quantification.....	9-5
9.1.4 Risk Handling/Response .....	9-6
9.1.5 Risk Impact Determination .....	9-6
9.1.6 Risk Reporting, Tracking, and Closeout .....	9-7
9.2 Risk Discussion .....	9-7
9.2.1 Characteristics of Acquisition Risk.....	9-7
9.2.2 Acquisition Program or Project Processes, Risk Areas, and Risk Events .....	9-8
9.2.3 Risk Management Plan.....	9-10
9.2.4 Risk Assessments and Cost and Schedule Estimates .....	9-11
<b>10.0 PERFORMANCE MEASUREMENT, EVALUATION, REVIEWS, AND REPORTING.....</b>	<b>10-1</b>
10.1 Performance Measurement—General.....	10-1
10.1.2 Measurement Considerations .....	10-2
10.2 Earned Value Management System .....	10-2
10.2.1 EVMS Fundamentals .....	10-3
10.2.2 EVMS Standard ANSI/EIA-748-1998.....	10-4
10.2.3 Performance Measurement Baseline.....	10-6
10.3 Project Management Metrics .....	10-10
10.4 Project Reviews .....	10-11
10.4.1 Project (Program) Management Reviews .....	10-13
10.4.2 Independent Reviews .....	10-14
10.4.3 Technical Reviews .....	10-15
10.4.4 Operational Readiness Review .....	10-16
10.5 Reporting.....	10-16
10.5.1 Monthly Reports.....	10-16
10.5.2 Quarterly Reports .....	10-17
<b>11.0 PROJECT CONTROLLING .....</b>	<b>11-1</b>
11.1 Contract Management.....	11-1
11.1.1 Integrating Project and Performance-Based Contracting.....	11-2
11.1.2 Integrating Contractor Performance Data .....	11-4
11.1.3 Review and Analysis of Contractor’s Performance Data .....	11-4
11.1.4 Contract Closeout.....	11-4
11.2 Baseline Change Control .....	11-4
11.2.1 Controlling Baseline Changes.....	11-5
11.2.2 Change Principles and Processes .....	11-5



11.2.3 Input to Change Requests.....	11-5
11.2.4 Change Control Board.....	11-6
11.2.5 Control Levels.....	11-6
11.2.6 Change Initiation.....	11-6
11.2.7 Change Documentation.....	11-7
11.3 Interface Management .....	11-7
11.3.1 Responsibilities .....	11-8
11.3.2 Identify Interfaces .....	11-9
11.3.3 Develop Interface Control Documentation .....	11-10
11.3.4 Review and Approve Interface Documents .....	11-10
11.3.5 Closeout .....	11-11
<b>GLOSSARY</b> .....	A-1
<b>ACRONYMS</b> .....	A-26
<b>REFERENCES</b> .....	B-1
Department of Energy.....	B-1
Other Federal .....	B-5
Industry/Commercial/Other .....	B-7
Suggested Reading.....	B-8
<b>PROJECT LIFE CYCLES</b> .....	C-1
C.1 Example Project Life Cycles and Project Phases .....	C-1
C.1.1 System Projects .....	C-1
C.1.2 Environmental Management Projects.....	C-3
C.1.3 Information Technology Projects .....	C-4
C.2 Project Overview Charts .....	C-4
Project Overview for System Projects (Initiation - Definition Phases) .....	C-1
Project Overview for Environmental Restoration Projects.....	C-3
Project Overview for Disposition Projects (Initiation – Definition).....	C-5
Project Overview for IT Projects (Initiation – Definition).....	C-7

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# 1 ACQUISITION MANAGEMENT SYSTEM OVERVIEW

Federal program and project managers are accountable for the planning, programming, budgeting, and acquisition of capital assets. The principal Department of Energy (DOE) goal is to deliver capital assets on schedule, within budget, and fully capable of meeting mission performance, quality, and environmental, safety, and health standards. DOE Federal program and project managers are responsible for ensuring that capital asset projects are managed with integrity and in compliance with applicable laws.

DOE Federal managers will:

- Justify budgets needed for acquisition of capital assets
- Ensure line management involvement in and accountability for project performance
- Establish and maintain strong project management organizations and systems
- Use appropriate project management tools
- Develop, train, and qualify project personnel
- Develop and implement programs for institutionalizing project management capabilities.

## 1.1 FUNDAMENTAL PRINCIPLES

The requirements contained in the Manual are rooted in five fundamental principles. The principles form the foundation for the requirements and guidance contained in the Manual. These principles are:

1. Key decisions are made by those who are accountable to the Secretary, the Administration, and Congress.
2. Thorough planning, with special attention to managing risk, is paramount to the executability of a project.
3. Independent reviews provide critical confirmation and confidence that the essential foundation has been established, plans are realistic, and the project is executable.
4. An effective, functioning project management and control system is an indispensable tool for planning, executing, and measuring progress and performance.
5. Communicating accurate status to stakeholders and those accountable is an obligation and is vital for continued support.

This Manual is mandatory for all DOE and National Nuclear Security Administration (NNSA) projects. **The requirements identified in this Manual shall be implemented by all projects having a total project cost (TPC) greater than \$5M.** Projects having a TPC less than \$5M may use their own discretion in applying the requirements contained in this Manual.

In addition to being located in the various chapters, which places them in context, all requirements are consolidated in Chapter 2, Table 2-1. These fundamental requirements are cross-referenced to the Manual by page and paragraph. All fundamental requirements appear in their appropriate sections throughout the Manual in **bold** type.

This Manual encompasses and describes all project phases from Initiation through Transition/Closeout. Decisions, planning, budgeting, scheduling, and other key processes are described including roles and responsibilities for program and project managers and Integrated Project Teams (IPTs).

This Manual contains requirements, direction and guidance, based upon past lessons learned and national standards that have proved valuable for successful projects. The requirements are to be tailored appropriately in consideration of the complexity, cost, and risks of each acquisition project. Each requirement must be addressed to the extent necessary and practical for managing each project. Tailoring may involve consolidation of decisions, documentation, and concurrency of processes. Tailoring does not imply the omission of decisions or the failure to address aspects of processes that are appropriate to a specific project's requirements or conditions. A clear understanding of the reasons for elimination (or combination) must be documented, and management acceptance obtained.

## **1.2 ACQUISITION MANAGEMENT SYSTEM**

The acquisition system establishes a management process to translate user needs and technological opportunities into reliable and sustainable systems that provide the required mission capability. The system is organized by phases and key decisions (Critical Decisions). Critical Decisions are made by designated Acquisition Executives (AEs) and the Secretarial Acquisition Executive (SAE) for major systems (MS). The phases are a logical means of translating broadly stated mission needs into well-defined system, safety, and quality requirements; and ultimately into operationally effective, suitable, and affordable systems.

### **1.2.1 Initiation**

During the Initiation phase, analysis is conducted which considers the Departments strategic plan, Congressional direction, Administration initiatives as well as political and legal issues. The outcome of the analysis is a determination that a need exists which can not be met through other than material means. This phase culminates in the development and approval

of a mission need statement (MNS) which discusses the need in terms of required capability, not equipment, facilities or other specific products. This is the first Critical Decision of the acquisition process—Approve Mission Need (Critical Decision-0).

### **1.2.2 Definition**

Upon approval of the MNS, the project enters the Definition phase where concepts and alternatives are explored considering requirements, risk, costs, and other constraints to arrive at a recommended alternative. This is accomplished utilizing systems engineering and other techniques and tools, such as alternatives analysis and value management (VM), to ensure the recommended alternative provides the essential functions at the lowest life cycle cost, consistent with required performance, scope, schedule, and cost. The recommended alternative, when sufficiently defined and analyzed, is to be submitted to the AE for review and approval as part of the Critical Decision-1. During this phase products are developed which contribute to the definition of the capability: conceptual design, requirements definition, risk analysis and management plan, and the acquisition strategy (AS). These products provide the detail necessary to develop a rough order of magnitude or range for the cost and schedule. The recommended alternative is presented to the SAE or AE for review and approval as Critical Decision-1 (CD-1)—Approve System Requirements and Alternatives. The information developed during this phase also provides the basis for the Project Engineering and Design (PED) budget request when PED is being used.

### **1.2.3 Execution**

Upon completing the Definition phase, the project enters the Execution phase where the focus is on further defining the selected alternative, developing preliminary designs, arriving at a high confidence baseline, and generating the complete project plan; all of which support a budget request to complete implementation. The effort culminates with the development of the Acquisition Performance Baseline (APB), which is presented to the SAE or AE for Critical Decision-2 (CD-2)—Approve APB. The APB documents the project's commitment to execute the project at a specific cost and schedule threshold and achieve a specific performance capability. After Critical Decision-2, the project continues engineering and design until the project matures to the point where it is ready for implementation. Prior to committing major budget and other resources for implementation, an executability review is performed resulting in Critical Decision-3 (CD-3)—Authorization to Implement.

### **1.2.4 Transition/Closeout**

Transition/Closeout of all projects is that period when the project is approaching completion and has progressed into formal transition, which generally includes final testing, inspection, and documentation as the project is prepared for operation, long-term care, or closeout. Once the implementation is substantially complete, the project begins the transition to operations. The transition point will depend on the type of project. The point at which the

required capability is implemented and functioning, and operational resources are in place, trained, and able to perform their continuing responsibilities is the point at which a project may seek approval to transition to operations, and be declared complete: Critical Decision-4 (CD-4)—Approve Transition and Turnover. A project may have achieved initial operating capability (IOC) and not full operating capability (FOC) before seeking Critical Decision-4. The decision whether to employ IOC or FOC may depend on the type of project. Some projects require an extended period of commissioning, calibration, and testing using operations personnel, before reaching their design parameter state. In those cases Critical Decision-4 at IOC may be more appropriate. Figure 1-1 illustrates the overall system. This period of time preceding Critical Decision-4 includes sufficient completion of a readiness assessment (RA) or operational readiness review (ORR) to reach IOC and completion of lessons learned, records transfer, final cost report, and appropriate demobilization.

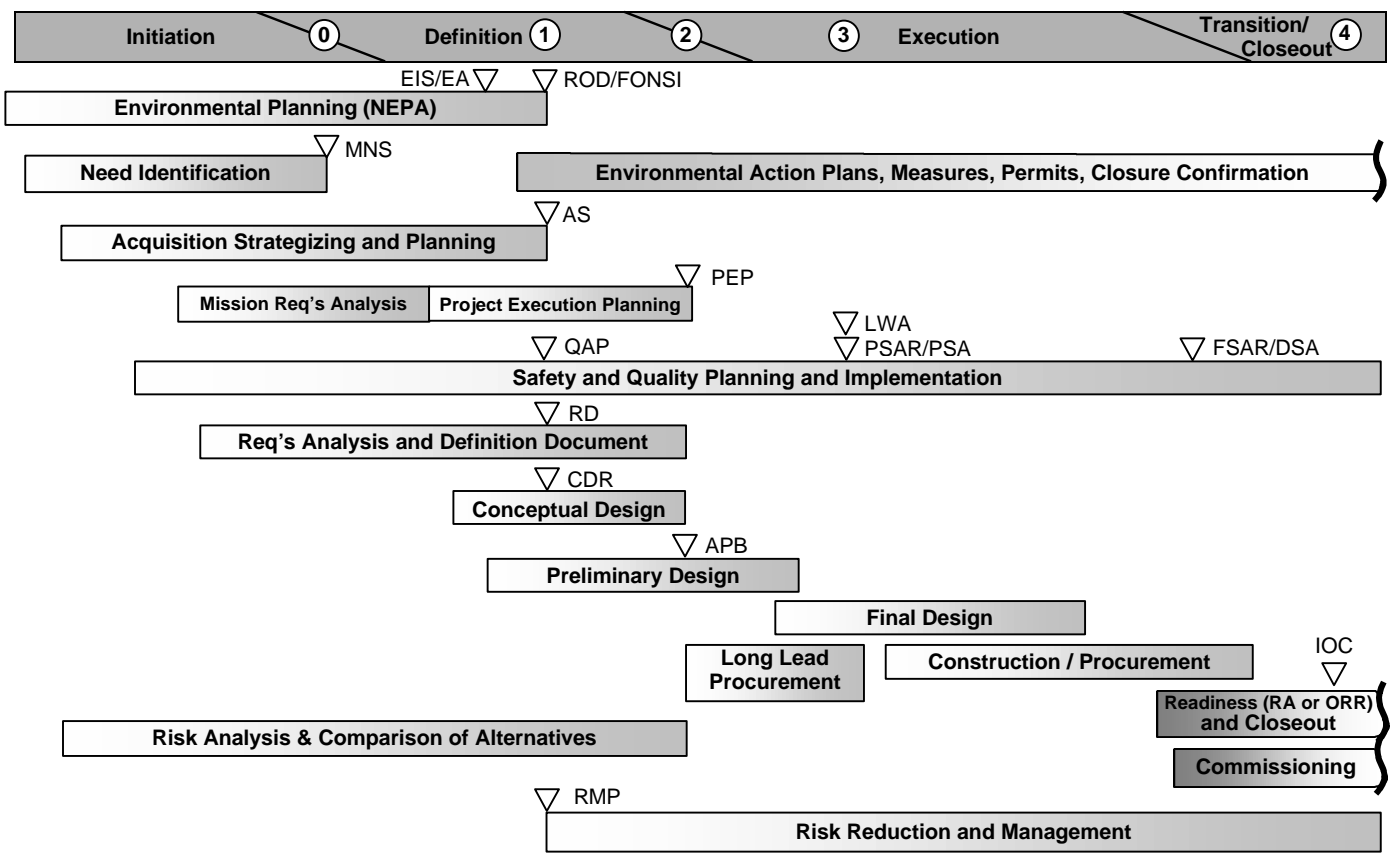


Figure 1-1. Department of Energy Acquisition Management System

### 1.3 PROGRAM AND PROJECT TAXONOMY

To execute its mission, the Department organizes related and interdependent mission elements into programs. Programs may be comprised of on-going operational activities with

no set duration or acquisition activities with specific durations or combined acquisition and operational programs. An operational activity is typically identified by multiyear work activities which employ relatively straight line funding over an extended period of time and work planning that is normally accomplished for each year. Acquisition projects are structured to deliver a defined capability within specified period and cost and have a funding plan that ramps up to a peak in the middle of the project with a corresponding ramp down as the project progresses to completion. Acquisition projects are planned from the start of the project to its completion without regard to the change in years. Programs and projects have many similar attributes. They both explore a full range of implementation options including the development of new technologies. They also perform life cycle cost and performance analyses (value management) of alternatives that are expected to have a high degree of technical and operational feasibility. This Manual makes no distinction whether a collected set of activities is called a program or a project. The key discriminator is not the title, but whether an asset is being acquired.

### **1.3.1 Programs**

A Program is an organized set of activities directed toward a common purpose, objective, or goal undertaken or proposed by an agency in order to carry out responsibilities assigned to it. The term is generic and may be applied to many types of activities. Acquisition programs are programs whose purpose is to deliver a capability in response to a specific mission need. Acquisition programs may comprise multiple acquisition projects and other activities necessary to meet the mission need.

### **1.3.2 Projects**

Projects are specific undertakings that meet a new or revised mission need, involve diverse but related scopes of work, and have a beginning and an end. DOE projects range from relatively simple vertical construction of a building to developing, designing, and implementing large, complex, one-of-a-kind systems made up of multiple sub-systems that require the integration of multiple locations and systems into a unified whole. Projects also include activities such as developing and installing software systems, and remediating and dispositioning contaminated sites and facilities. Most projects are characterized as a collected set of overlapping, interdependent activities. For example, design may be ongoing in one project area while in another project area items may be in construction or testing.

For the purpose of identifying, characterizing, and reporting, the following definitions are employed:

- Plant—A complete and usable capability for the purpose of producing an output product
- Facility Construction—A project whose end objective is a structure designed for general purpose use

- System—A complete and usable capability for scientific and technical purposes including research and development
- Restoration—A project whose purpose is the restoration of real property
- Disposition—A project whose purpose is the demolishing and/or disposition of capital assets
- Infrastructure Improvement—A project whose purpose is to upgrade, improve, or rehabilitate existing assets (excluding mission systems and plants)
- Information Technology—A complete and usable capability for the purpose of creating, storing, and processing information.

## **1.4 PLANNING, PROGRAMMING, AND BUDGETING SYSTEM**

The Planning, Programming, and Budgeting System (PPBS) is the process that is used to determine which Programs, and more specifically, which requirements receive funding and at what amount. The PPBS process is cyclic and contains three interrelated, overlapping elements: planning, programming, and budgeting. The goal of the PPBS is to obtain and provide the best mix of needed resources to meet DOE's objectives within fiscal constraints. Program management and budget execution are integrated with other PPBS activities to provide a consistent basis for resource management from planning through execution.

To support the PPBS, the Secretary has established business management processes and systems that are standardized (where feasible), and where appropriate, flexible (tailored) to its diverse programs. The PPBS process is institutionalized throughout Headquarters and the Field, and uniform guidance that clearly outlines the requirements for the PPBS process is issued at least yearly by each program lead. The Department tracks and manages its Programs and projects from requirements initiation through closeout and turnover to assure compliance with the PPBS.

The PPBS is implemented within the overarching framework of the Department's Strategic Management System. The goals of the System are to align strategic and operational planning with strategic intent, ensure that planning drives resource allocation, provide for regular evaluation of results, and generate feedback. The PPBS provides additional structure and implementation details to the Department's strategic management system to accomplish the Program Assistant Secretaries (PAS) objectives, and to focus on needed improvements. The PPBS process is described in the DOE budget formulation handbook. The relationship between the budget submission and the project phases is shown in Figure 1-2.



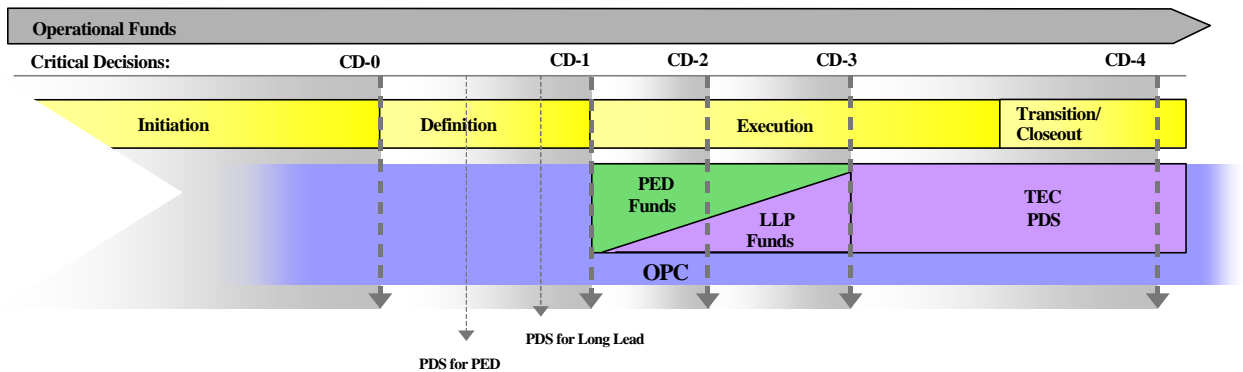


Figure 1-2. Budgeting Process and Funding Types

## 1.5 RISK MANAGEMENT

The DOE risk management concept is based on the principles that risk management must be forward-looking, structured, informative, and continuous. The key to successful risk management is early planning and aggressive execution. Good planning enables an organized, comprehensive, and iterative approach for identifying and assessing the risk and handling options necessary to refine a program acquisition strategy. To support these efforts, assessments should be performed as early as possible in the life cycle to ensure that critical technical, schedule, and cost risks are addressed with mitigation actions incorporated into program planning and budget projections. IPTs should update project risk assessments and tailor their management strategies accordingly. Early information provides data that helps in writing a Request for Proposal and assists in Source Selection planning. As a program progresses, new information improves insight into risk areas, thereby allowing the development of effective handling strategies. The net result promotes executable projects.

Effective risk management requires involvement of the entire team and also requires help from outside experts knowledgeable in critical risk areas such as technology, design, cost, etc. In addition, the risk management process must address every element of the project throughout all phases of the project. It is essential that all stakeholders participate in the assessment process so that an acceptable balance between cost, schedule, performance, and risk can be reached. A close relationship between the Government and industry, and later with the selected contractor(s), promotes an understanding of program risks and assists in developing and executing the management efforts.

## 1.6 INTEGRATED PROJECT TEAM

The IPT is an essential element of the Department's acquisition process and will be utilized during all phases of the acquisition process. An IPT functions as follows:

- Open discussions with no secrets

- Qualified, empowered team members
- Consistent, success-oriented, proactive participation
- Continuous “up- and down-the-line” communications
- Uninhibited coordination and cooperation
- Reasoned disagreement
- Early issue identification and resolution.

A project or program may employ multiple IPTs when project complexity warrants it. Some may have over-arching responsibilities across various programs and projects. They may also be established to resolve issues. However, for each project there will be only one over-arching IPT specifically charged with executing a project. This IPT’s interaction with other teams and organizations is to be reflected in the Project Execution Plan (PEP). IPTs are to be empowered and authorized to make commitments for the organization and to work together to achieve successful projects. All essential skills are to be represented on the IPT, and the project must be a priority responsibility for the members. IPTs are established during the Initiation phase of the acquisition process and are led by the PM. If a PM is not yet assigned, the Program Manager will organize and lead the team until the PM is available. As IPT leader, the PM is responsible for:

- Preparing and maintaining a team charter and operating guidance
- Providing the team with broad program guidance and delegating project decision-making authority appropriate to the member’s competency and limitations of authority
- Requesting and allocating budget
- Maintaining an environment that rewards team success
- Appointing appropriate leads within the team
- Providing project orientation for personnel assigned to the team
- Keeping the team and upper management informed
- Scheduling and holding regular meetings, generally allowing at least two days advance notice for an internal meeting and at least one week advance notice for an external meeting.

Team members will be representative of all competencies that influence or affect the execution of the project. As a project progresses from Initiation to Transition/Closeout completion, the IPT membership will change to incorporate the necessary skills and expertise required. This flexibility allows the PM to adapt the IPT to meet the constantly changing project needs. Team membership may be either full-time or part-time depending on the scope and complexity of the project. The team members are responsible to the team leadership for:

- Ownership of the IPT's charter, goals, and objectives
- Supporting project performance, scope, schedule, cost, and safety and quality objectives
- Identifying and meeting commitments
- Maintaining communication with their respective department/organizations, the PM, and other IPT members.

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# 2 REQUIREMENTS AND RESPONSIBILITIES

The acquisition management system employs a cascaded set of requirements, direction, guidance, and practices which minimizes mandatory requirements and provides balance and effectiveness while protecting the public trust.

All requirements and responsibilities are consolidated in this Chapter. These requirements create the framework within which the Department acquires capital assets. These requirements may only be deviated from with SAE approval.

Processes and procedures have been developed to implement the requirements. These processes are intended to be continually improved and consequently may be tailored depending on the type and complexity of the project. Tailoring of processes, while encouraged, is to be explained and documented in the PEP. Figure 2-1 provides a graphic representation of the Requirements cascade.

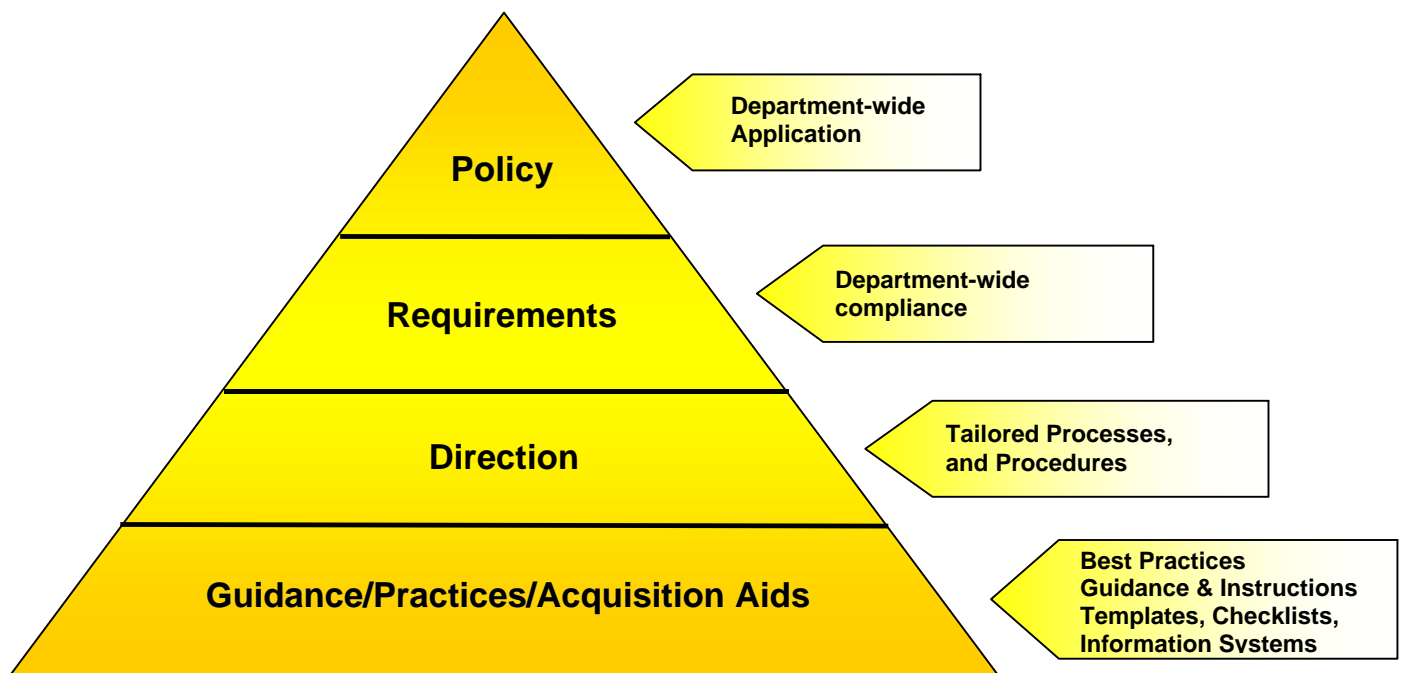


Figure 2-1. Acquisition Management System Requirements

## 2.1 REQUIREMENTS AND PROCESS FLOW

The requirements described in Table 2-1 are mandatory. They are listed consistent with the expected chronological flow of a project and its associated Critical Decisions. These core requirements are intended to be lean, yet comprehensive so that the Department can efficiently monitor and focus on the products and services that meet the unique needs of its numerous programs, customers, and users. The process flow and Critical Decisions do not necessarily indicate a specific time duration between decisions, but rather, indicate the required flow. For example, some projects may need or desire that two critical decisions occur at approximately the same time. This is acceptable as long as the deliverables and maturity of the deliverables meet the requirements of both decisions and the required timing is documented and approved in the project planning. Figure 2-2 is a high-level process diagram reflecting the overall system, and highlights most of the requirements.

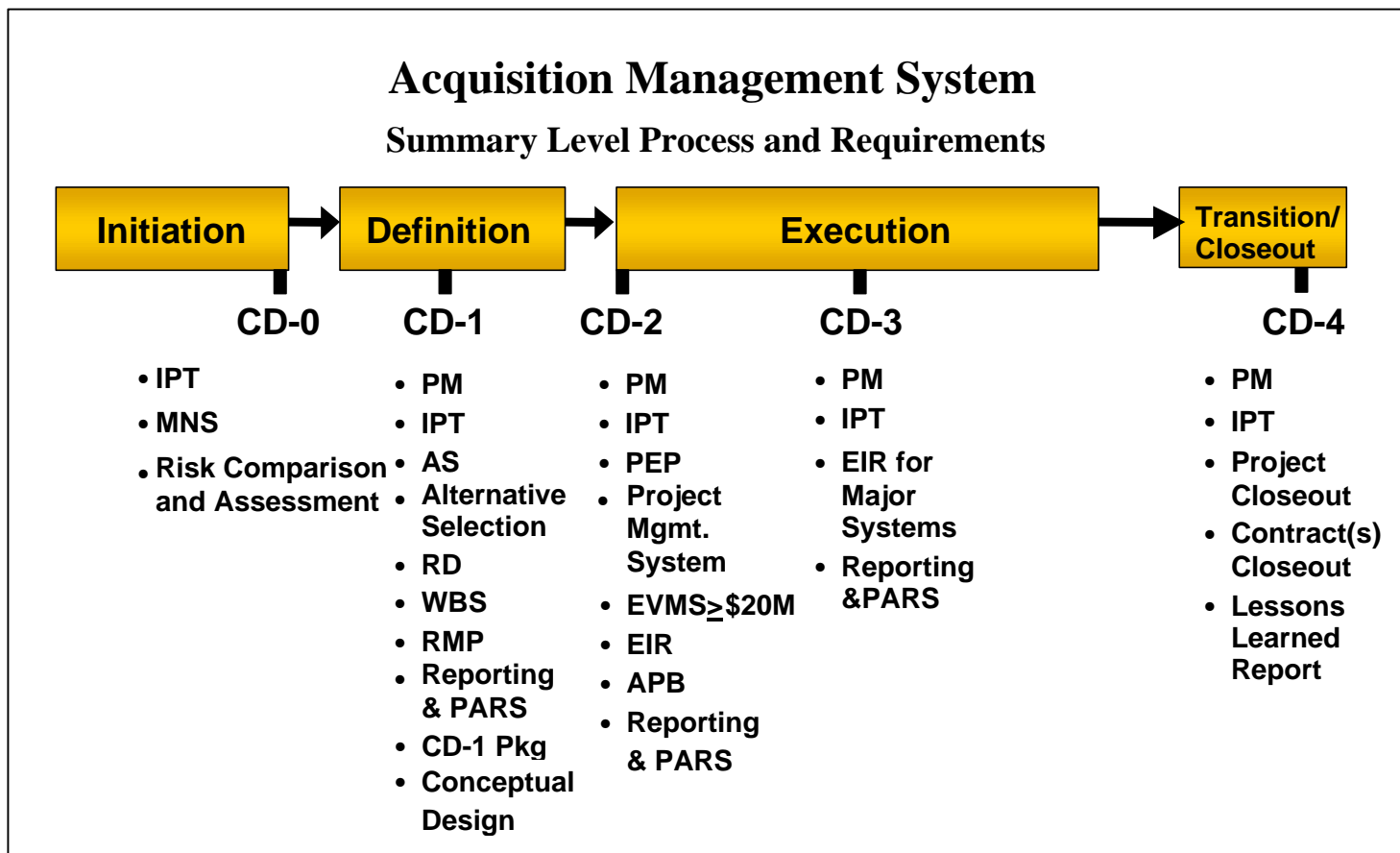


Figure 2-2. Acquisition Management System

**Table 2-1. Requirements**

Section	Page	Requirements	Responsible Org and/or Individual	Approving Official
1.0	1-2	The requirements identified in this Manual shall be implemented by all projects with a total project cost (TPC) greater than \$5M.	All Programs	Deputy Secretary
2.3	2-4	Roles, responsibilities, authorities, and approval thresholds in this Manual shall be complied with and only delegated as identified.	AE	Deputy Secretary
2.3.1	2-6	All projects shall employ the defined Critical Decisions: <ul style="list-style-type: none"> <li>• CD-0, Approve Mission Need</li> <li>• CD-1, Approve System Requirements and Alternatives</li> <li>• CD-2, Approve Acquisition Performance Baseline</li> <li>• CD-3, Authorization to Implement</li> <li>• CD-4, Approve Transition and Turnover</li> </ul>	PM	AE
2.6	2-14	Project changes shall be identified, controlled, and managed through a traceable, documented, and dedicated change-control process that is defined in the PEP and consistent with Table 2-3.	PM	AE
4.1	4-1	The MNS and justification shall be developed for all projects having a TPC greater than \$5 million.	Program or PM (if identified)	Program Manager
5.1.1	5-2	Each project shall document the requirements that form the basis for the design and engineering phase of the project and be delivered and approved at Critical Decision-1.	PM	AE
5.1.2	5-4	CDR shall clearly and concisely describe the alternative selected (scope, system/plant or facilities), how it meets the MNS, the functions/requirements that define it, and demonstrate the capability for success.	Program Manager and IPT	AE
5.2	5-6	A comprehensive AS shall be developed for each project in accord with this Manual, be integrated with the risk analyses, and evaluated by OMBE prior to approval by the designated approval authority.	Project Manager and IPT	SAE/Under Sec./ PAS, as approp.
5.3	5-14	A comprehensive Risk Management Plan, which documents the risks, analysis, and mitigation strategies shall be developed and submitted for approval as part of Critical Decision-1.	PM and IPT	AE
5.4	5-14	All projects shall perform formal System Engineering and Value Management. At a minimum, planning shall be accomplished prior to completing the conceptual design activity, initial VM/VE reviews performed as part of completing the CDR, and value studies as part of Critical Decision-2 deliverables.	PM and IPT	AE
5.4.1	5-15	A product-oriented WBS shall be developed as part of system requirements and alternative selection.	Project Manager	AE
5.6	5-19	The WBS shall be used to generate an order of range cost and schedule estimate and included in the Critical Decision-1 package.	IPT	PM
5.7	5-19	A PEP shall be prepared for each project; be an accurate reflection of how and by whom the project is to be accomplished; and prepared, submitted, and approved by Critical Decision-2.	IPT	PM

Section	Page	Requirements	Responsible Org and/or Individual	Approving Official
6.3	6-2	All projects shall establish an APB at Critical Decision-2, that includes key performance, scope, schedule, and cost parameters to clearly establish the capabilities being acquired; and the schedule and total cost to acquire the capability.	PM	AE
6.3	6-3	An external independent review (EIR) shall be performed by OMBE to validate the APB prior to approval at Critical Decision-2.	PM	AE
6.5	6-3	All projects shall identify a point of full execution and/or implementation (Critical Decision-3), schedule an EIR for MS, and an IPR for non-MS.	PM and IPT	AE
7.0	7-1	All projects shall plan and issue a project Transition/Closeout document (normally started in the Definition phase and issued in the PEP) which provides the basis for attaining initial operating capability (IOC) and obtaining Critical Decision-4 approval.	PM and IPT	AE
8.1.3	8-4	At a minimum Key Performance Parameters shall be established for TPC and Total Estimated Cost (TEC). The TPC is a maximum parameter that cannot be exceeded without being classified as a breach and presented to the AE for a decision.	PM	AE
8.2	8-5	The APB shall be risk assessed and adjusted for both durations and costs providing a realistic, achievable APB commitment.	PM	AE
10.0	10-1	No later than final APB approval, every project shall have a functioning performance management system (PMS).	PM	AE
10.2	10-3	For projects having a TPC greater than \$20M, the PMS shall be an EVMS that fully complies with ANSI/EIA-748.	PM	AE
10.2.2.1	10-5	All Earned Value Management Systems shall be certified by OMBE. Existing systems shall provide a system description or other equivalent documentation to OMBE that demonstrates compliance with ANSI/EIA 748-1998.	PM	OMBE
10.2.2.1	10-5	Once an EVMS system has been approved, all significant proposed changes shall obtain OMBE concurrence prior to implementation.	PM	OMBE
10.5.1	10-17	Each project shall report status and performance monthly utilizing the PARS, starting at CD-0.	PM	OMBE
10.5.2	10-18	Quarterly project progress reviews and reporting (monthly) shall be organized and conducted upon approval of the Mission Need (CD-0).	PM	AE
10.5.2	10-18	OECM shall be invited to all quarterly reviews for projects having a TPC greater than \$20 million.	PM	AE
11.3.2	11-9	All necessary interfaces shall be documented using appropriate interface documents.	IPT	PM

## 2.3 AUTHORITIES, DECISIONS, AND RESPONSIBILITIES

The authorities, decisions and responsibilities form the framework for the Acquisition Management System. The authority to make decisions and the responsibilities for executing



the decisions are aligned according to the complexity, criticality and cost parameters for all projects. This authority is by appointment and is designated or delegated as directed in this Manual. **Roles, responsibilities, authorities, and approval thresholds in this Manual shall be complied with and only delegated as identified.**

### **2.3.1 Critical Decisions**

The Critical Decisions points identify the exit points from one phase or stage of the project and entry to the succeeding phase or stage. As previously stated, the decisions mark an increase in commitment of resources and is made based on a successful and complete preceding phase. At the most fundamental level, the decisions are:

- There is a need which cannot be met through non-material means
- The selected alternative and approach is the right solution
- A definitive cost, schedule and performance (scope) been developed
- The project is ready for implementation
- The project is ready for turnover or transition to operations.

There is no defined or directed period of time between decisions. Many projects are able to quickly proceed through the early decision points because of the lack of complexity or the presence of constraints which reduce available alternatives, or the absence of significant technology and developmental requirements. In these cases, decisions are made with little or no time transpiring between phases. The thresholds and authorities for decisions are shown in Table 2-2. **All projects shall employ the defined Critical Decisions:**

- Critical Decision-0, Approve Mission Need

The MNS identifies a mission requirement that the Department cannot meet through some non-material means. Mission Needs are identified in terms of capability, not in terms of equipment, facility or other solution. Mission needs must be integrated with the Department's Strategic Plan (and lower level plans for each program) and must support that strategic plan. Approval of the mission need is the authorization to enter conceptual exploration where the alternatives are investigated and the functional requirements are defined.

- Critical Decision-1, Approve System Requirements and Alternatives

The selected alternative that results from the requirements analysis and concept exploration process is presented for approval as the approved solution to a mission need. While the solution/alternative is bounded by a range of costs, schedule, and performance, there is no committed or approved baseline until the design matures—when estimates and schedules can be defined with some certainty. Approval of the alternatives and range estimate includes identification of alternatives, trade studies,

development efforts, and testing requirements. Approval authorizes the beginning of preliminary design work.

- Critical Decision-2, Approve Acquisition Performance Baseline (APB)

The APB defines the cost, schedule, performance, and scope commitment by which the Department will execute the project. The APB is the result of a mature design, detailed schedules with resources applied, a detailed cost estimate for the entire project, and the defined performance parameters and scope. An approval of the APB marks the beginning of performance tracking. It also authorizes the project to proceed with critical and final design activities and submission of the total project budget request.

- Critical Decision-3, Authorization to Implement

Authorization to Implement is approval for the project to complete all procurement and construction activities, and the planning, implementing, and completion of all acceptance and turnover activities. This authorizes the project to commit all the resources necessary, within the funds provided, to execute the project.

- Critical Decision-4, Approve Transition and Turnover

Transition and Turnover is approval to transition or turnover to operations. It is predicated on the readiness of the operator(s) to operate and maintain the system, facility, or capability. Transition and turnover does not terminate all project activity. It marks a point at which the operations organization assumes responsibility for the operation and maintenance. This point can be either the initial operations capability (IOC) or the full operations capability (FOC).

Required outputs and documents that are developed and issued during the life cycle of a project are identified in Appendix C.

**Table 2-2. Critical Decision Authority Thresholds**

Critical Decision Authority	Critical Decision-0 Mission Need	Acquisition Strategy (part of CD1)	Critical Decisions 1-4	
Secretarial Acquisition Executive	>\$400M (OMBE Review & Evaluate)	>\$400M (OMBE Review & Evaluate)	>\$400M <\$400M when designated by SAE	
Under Secretaries/ NNSA Administrator (Acquisition Executive)	\$20M - \$400M With no further delegation (OMBE Review & Evaluate)	\$20M - \$400M With no further delegation (OMBE Review & Evaluate)	<\$400M	
Program Assistant Secretaries or Deputy Administrators for NNSA	\$5M - \$20M With no further delegation (OMBE Review & Evaluate)	\$5M - \$20M With no further delegation (OMBE Review & Evaluate)	<\$100M	<b>Acquisition Executive Delegation Allowed</b>
			<\$20M	To a Senior Executive Service Program Manager or Operations/ Field Office Manager
			<\$5M	To a Senior Executive Service direct reporting subordinate of the Operations/ Field Office Manager

## 2.4 ROLES AND RESPONSIBILITIES

The assigned roles and responsibilities for the requirements and functions defined in this Manual are contained in the following paragraphs. The PM is essential to executing the Acquisition Management System. However, various other line positions and offices perform key functions and provide critical support for the success of the project. The term “Project Manager” as used in this Manual is synonymous with the term “Federal Project Manager” and both terms are used interchangeably. The Department employs the IPT approach for the acquisition of capital assets. The IPT for each project is a formal team with the PM serving as the team leader. The IPT membership is comprised of all the business and technical disciplines, such as legal, financial, contracting, safety, and environmental health and others) that are necessary to contribute to the execution of the project. IPTs are further discussed later in the Manual.

The Department executes its acquisition projects through contractors. Consequently, contractor position titles such as “Project Manager,” “Program Manager” and others may be identical to government position titles. The identical use of any of the position titles by a contractor does not convey to the contractor the responsibility or requirements contained in

this Manual. Contractual requirements will be stated in terms of the specific contract, not by position title.

Authority for the acquisition of capital assets begins with the Deputy Secretary of Energy, as the SAE who is the senior manager for the Acquisition Management System. The Deputy Secretary may delegate Acquisition Executive (AE) authority for non-Major Systems (non-MS) to an Under Secretary or to the NNSA Administrator, both of whom may re-delegate AE authority, as listed in Table 2-2.

#### **2.4.1 Deputy Secretary**

The SAE reports, as Deputy Secretary, directly to the Secretary and has line accountability for all Program/project execution. Additionally, the SAE serves as the Chief Operating Officer for DOE. The SAE also:

- Serves as the senior manager responsible and accountable for all project acquisitions
- Exercises decision-making authority, including Critical Decisions on MS projects
- Approves statement of mission need (Critical Decision-0) for all MS projects.
- Approves, statement of mission need (Critical Decision-0) for projects having a TPC between \$20M and \$400M
- Approves all Acquisition Strategies for projects having a TPC of \$100 million or greater
- Conducts quarterly reviews of the Department's largest projects as identified
- Approves disposition of projects that breach the approved APB
- Serves as the Chair for the Energy Systems Acquisition Advisory Board (ESAAB)
- Approves site selection for facilities for new sites.

#### **2.4.2 Under Secretary for Energy, Science and Environment and the Administrator for NNSA shall:**

- Receive AE authority from the SAE for projects having a TPC less than \$400M
- Delegate as appropriate, AE authority for projects having a TPC less than \$400M
- Approve MNS (Critical Decision-0) for all projects having a TPC between \$20M and \$400M with no further delegation
- Approve Acquisition Strategies for projects having a TPC between \$20M and \$400M with no further delegation
- Serve as the Chair and appoint members of an Advisory Board, and direct internal independent reviews
- Approve Level-1 changes to the project that are within the APB.

### **2.4.3 Program Assistant Secretaries, including the Deputy Administrators for NNSA, Program Directors, and Others Reporting at this Level shall:**

- Have line accountability for applicable Program/project execution and implementation of policy promulgated by Headquarters staff and support functions
- Establish direct-report project management support offices and define their roles and responsibilities when the program has project management responsibility
- Execute accountability for site-wide environment, safety and health, and safeguards and security
- Select and charter program managers and establish IPTs no later than Critical Decision-0
- Execute program management responsibilities including the acquisition of capital assets
- Develop the request for PED funding, authorize its use, and notify Congress before initiating a preliminary design for a new project
- Approve Acquisition Strategies for projects having a TPC between \$5M and \$20M with no further delegation
- When delegation is received, serve as the AE for Critical Decisions for non-MS projects having a TPC less than \$100M
- Approve statements of mission need (Critical Decision-0) for projects having a TPC between \$5M and \$20M, with no further delegation
- Approve selection of the PM for projects no later than Critical Decision-1, where the equivalent AE functions have not been further delegated
- Delegate when appropriate, equivalent AE functions to a Senior Executive Service Program Manager or Operations/Field Office Manager for projects having a TPC less than \$100M
- Serve as the Chair and appoint members for an Advisory Board and direct independent reviews
- Approve the IPT charter
- Approve all Level-2 project changes that are within the APB.

### **2.4.4 Program Manager shall:**

- Direct initial project planning and execution roles for projects assigned by the AE
- Initiate definition of mission need based on input from sites, laboratories, and Program Offices
- Develop the charter for and establish the IPT, if the PM has not yet been identified, and include a Contracting Officer (CO) as a member of the team

- Oversee development of project definition, technical scope, and budget to support mission need
- Initiate development of the acquisition strategy for completion of the Acquisition Strategy prior to or at Critical Decision-1 (during the period of time preceding designation of the PM)
- Recommend a PM for those projects for which the PAS retains AE responsibility, and approve the PM when the Program Manager has been delegated AE authority no later than Critical Decision-1
- Develop project performance measures, and monitor and evaluate project performance throughout the project's life cycle
- Allocate resources throughout the Program
- Oversee the project line management organization
- Perform functions as AE when so delegated by the PAS and/or the Deputy Secretary, Under Secretary, or NNSA Administrator.

#### **2.4.5 Project Management Support Office shall:**

- Provide independent oversight and report directly to the Under Secretary, NNSA Administrator, or PAS, as appropriate
- Serve as the Secretariat for the PAS Advisory Board functions
- Coordinate quarterly performance reports for the PAS
- Coordinate with other Department organizations and office, including OMBE, to ensure effective and consistent implementation of this Order
- Provide assistance and oversight to line project management organizations
- Analyze project management execution issues for the PAS.

#### **2.4.6 Operations/Field Office Manager/Field Managers for NNSA Operations shall:**

- Report directly to the PAS or Deputy Administrators and have line accountability for contract management of all site program/project execution
- Recommend a PM for those projects for which the PAS retains AE responsibility.
- Approve the PM where the Operations/Field Office Manager has been delegated AE authority no later than Critical Decision-1
- For projects having a TPC less than \$20M, may delegate project planning and execution roles, including performance reviews, to a direct reporting subordinate manager (or Senior Executive Service subordinate manager for AE delegation)

- Perform functions as AE when so delegated by the PAS.

#### **2.4.7 Project Manager shall:**

- Be responsible and accountable for project management activities of one or more discrete projects under their cognizance
- Be responsible and accountable for planning, implementing, and completing a project using a systems engineering approach
- Develop and implement the AS and PEP
- Define project objectives, technical, schedule, and cost scopes
- Allocate project funding and authorize work activities
- Direct the design, construction, environmental, safety, health, and quality efforts performed by various contractors, and other functions enumerated in the PEP, in accordance with public law, regulations, and Executive Orders
- Provide for the timely, reliable, and accurate integration of contractor performance data into the project's scheduling, accounting, and performance measurement systems
- Evaluate and verify reported progress; make projections of progress and identify trends
- Serve as the single point of contact between Federal and contractor staff for all matters relating to the project and its performance
- Serve as the Contracting Officer's Technical Representative, as appointed.
- Develop, staff and issue the IPT charter when not accomplished by the program manager
- As delegated by Operations/Field Office Manager or Program Manager, approve all deviations that exceed Level-2/3 thresholds for projects having a TPC greater than \$5M.

#### **2.4.8 Integrated Project Team shall:**

- Support the PM in performing all their assigned responsibilities.
- Develop and implement an appropriate project contracting strategy
- Assure all project interfaces are identified, completely described/defined, and managed to completion
- Identify and define appropriate and adequate project key performance parameters: (KPPs), key schedule parameters (KSPs), and key cost parameters (KCPs)
- Perform monthly review and assessment of project performance and status against established performance parameters, baselines, milestones, and deliverables
- As necessary, plan and participate in project reviews, audits, and appraisals

- Review all Critical Decision packages for completeness and recommend approval/disapproval
- Review and comment on project deliverables, e.g., drawings, specifications, procurement, and construction packages
- Review change requests (as appropriate) and support change control boards (CCBs) as requested
- Plan and (as appropriate) participate in the project's operational readiness review (ORR)
- Support the preparation, review, and approval of project completion and closeout documentation.

#### **2.4.9 Office of the Chief Information Officer shall:**

- Establish and maintain Department-wide guidance for Information Technology (IT) investment management projects, including IT hardware, software and application, and capital assets
- Develop supporting policy, requirements and guidance for IT investments and projects
- Provide IT investment management process assistance to Program Office, Field Office, Site, and contractor locations, as requested
- Regularly collect process performance measurement information, and prepare a summary report on the status and performance of IT investment management processes.

#### **2.4.10 Office of Management, Budget and Evaluation shall:**

- Serve as DOE's principal point of contact relating to project management
- Develop policy, requirements and guidance for the acquisition of capital assets
- Assist in the planning, programming, budgeting, and execution process for the acquisition of capital assets in coordination with PAS and project management support offices
- Support the Office of the Secretary, the SAE, the Administrator of NNSA, and the Program Assistant Secretarial Office in the Critical Decision process for MS projects and oversight of the DOE's project management process
- Serve as Secretariat for the ESAAB functions
- Establish and oversee the PM professional development programs
- Review and certify Earned Value Management Systems and approve significant changes to them
- Provide an independent assessment and analysis of the project planning, execution and performance



- Review and provide concurrence for MNSs and Acquisition Strategies for all projects
- Develop and maintain a corporate project reporting capability
- Establish, maintain and execute a corporate independent review capability
- Develop and provide oversight for the Deputy Secretary with a Critical Decision-0 review and approval process.

## **2.5 ENERGY SYSTEMS ACQUISITION ADVISORY BOARD**

The Energy Systems Acquisition Advisory Board (ESAAB) advises the SAE on decisions to MSs, site selection and breach disposition. The ESAAB meets once every two months, or at the call of the SAE.

- Membership. ESAAB membership includes the SAE as Chair, the Under Secretary and NNSA Administrator; the DOE, General Counsel; the Director of Office of Management, Budget and Evaluation/Chief Financial Officer (OMB/CFO); the Director of OECM; the Assistant Secretary for Environment, Safety and Health; the Assistant Secretary for Environmental Management; the Deputy Administrator for Defense Programs; the Director for Office of Science; and the Director of Procurement and Assistance Management. The Deputy Secretary may designate other PASs or functional staff as board members, as needed.
- ESAAB Secretariat. The ESAAB Secretariat resides in OECM and provides administrative and analytical support and recommendations to the ESAAB.

### **2.5.1 Non-Major System Project Advisory Boards**

The designated AE will appoint an advisory board for advising on actions for projects that are non-MSs. The designated AE is the chair of the advisory board. The advisory board replicates and conducts identical functions as those performed by the corporate ESAAB. Members may be selected from within the AE's organization. However, at least one member from an office not under that AE will be designated as a contributing representative. OECM will provide a member of each Advisory Board for projects having a TPC less than \$400M. The implementing documentation for these boards, along with the composition of the boards will be provided to OECM.

### **2.5.2 Advisory Boards for Delegated Projects**

Each PAS/Deputy NNSA Administrator may delegate equivalent AE functions, including decision approvals, for projects having a TPC between \$5M and \$20M to a Senior Executive Service Program Manager or an Operations/Field Office Manager. The Program Manager or Operations/Field Office Manager may further delegate equivalent AE functions to a direct reporting Senior Executive Service subordinate. The PAS and/or designated AE establishes and chairs an Advisory Board, and notifies OECM of its composition, invites OECM to all

board meetings, and provides all agendas and minutes to OECM and the appropriate Project Management Support Office. However, OECM is not a board member.

## 2.6 CHANGE CONTROL

Changes within the APB are routinely accomplished during the development process as the design, engineering, and risk management efforts continue. These changes can be technical, budgetary, or schedule changes. Establishing a formal change control process permits these routine changes to be managed to integrate the cost, schedule and technical parameters that are affected by each change. **Project changes shall be identified, controlled, and managed through a traceable, documented, and dedicated change-control process that is defined in the PEP and consistent with Table 2-3.** The associated change control thresholds for each project are documented in the PEP, and approved at Critical Decision-2 (APB).

**Table 2-3. Change Control Authority**

Approval Authority			
Level-1 Changes – Under Secretary or NNSA Administrator			
Level-2 Changes – PAS/Deputy Administrator			
Level-3 Changes – Project Manager as delegated			
Major and Non-Major System Projects:			
	Level-1	Level-2	Level-3
<b>Technical</b>	Changes to technical requirements and parameters that do not meet mission need objectives	Changes to technical requirements and parameters that affect safety basis, operation functions but does not affect mission need	As defined in the PEP
<b>Schedule</b>	6 or more months increase (cumulative) in a project-level schedule milestone date, not exceeding the APB threshold	3 to 6 months increase (cumulative) in a project-level schedule milestone date	As defined in the PEP
<b>Cost</b>	Increase of over \$50M and/or Increase in TEC requiring Congressional reporting and not exceeding the APB TPC	Increase of over \$25M	As defined in the PEP

## **2.7 REFERENCES, OTHER REQUIREMENTS, AND APPENDICES**

This Manual is not the sole source for all requirements and guidance that applies to the acquisition of capital assets. Other Departmental Orders and Manuals, especially in regard to radiological design, engineering, safety and security, environmental and other laws, regulations, including the Federal Acquisition Regulations (FAR), and local and state laws, all influence, guide, and direct the acquisition of capital assets. This Manual and the associated Practices provide the framework and planning processes for projects. Identification, implementation, and compliance with other requirements are the responsibility of line management, including the PM and the IPT. Indeed, one of the primary purposes of the IPT is to ensure that the breadth of requirements is included in the project scope. Where specifics are included, they are identified in Appendix B.

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# 3 INTEGRATED SAFETY, ENVIRONMENTAL, QUALITY ASSURANCE, AND SAFEGUARDS AND SECURITY

A key component of the successful project is that safety, health, environmental, and quality issues are addressed early in a project's life cycle and fully integrated into all project activities. The responsibility for the safety and health of the public and the work force, protection of the environment, and quality is a line management responsibility, owned by the entire IPT. An Integrated Safety Management System (ISMS) is most effective when developed early and implemented throughout all project phases. ISMS is designed to ensure that safety basis, environmental protection, and worker and public safety is appropriately addressed in the planning and performance of any task. The fundamental premise of Integrated Safety Management (ISM) is that accidents are preventable through early and close attention to the planning, design, and physical execution of a project. Early stakeholder involvement in the planning and execution of a project, utilizing appropriately revised and approved standards is the norm. During the Initiation and Definition phases, the project has the unique opportunity to eliminate or minimize hazards, and incorporate cost-effective accident prevention and mitigative features. This includes taking a fresh look at the reference design to provide safety through design. Implementation of safety, health, environmental protection, and quality is to be fully integrated based on principles, acquisition and project plans, and procedures. Throughout this Manual, the term safety encompasses protection of the public, the workers, and the environment. Quality, safety, and environmental protection are to be integrated from the beginning into all projects. This section discusses the integration of safety, health, and environmental protection followed by an adherence to quality.

## 3.1 SAFETY

A primary and continuous responsibility of project management is safety. This includes project plans and safety of project personnel, including those who will operate or maintain the facility, or who could otherwise be affected by the decisions made during the project planning, design, construction, and testing stages. This responsibility begins at the time a project or remedial action is planned and continues until the project or remedial action is completed. As the PM develops and maintains project baselines, the focus is on providing a safe, quality design.

Department Policy, DOE P 450.4 requires that safety management systems be used to systematically integrate safety into management and work practices at all levels so that missions are accomplished while protecting the public, the worker, and the environment. Integrated Safety Management (ISM) is required as part of DOE management of projects. As stated in DOE P 450.4, *Safety Management System Policy*,

“This is to be accomplished through effective integration of safety management into all facets of work planning and execution. In other words, the overall management of safety functions and activities becomes an integral part of mission accomplishment.”

This policy requires that ISM functions and principles apply to all project and remedial action activities through all phases of these efforts. Ensuring adequate protection of the public, the workers, and the environment is an essential activity of the IPT, including project planning, design, technology development, construction, testing and turnover, and facility disposition. Each of these key areas is discussed in later subsections.

Project management, in using ISM, ensures that work processes related to planning and engineering are executed with attention to safety; and that work processes related to research, development, testing, use of hazardous materials, and construction techniques are executed with proper controls. This section will describe how ISM functions and principles are to be applied to the execution of a DOE project during each of its stages.

DOE is committed to conducting all work on its projects so that missions can be accomplished with adequate controls in place to protect workers, the public, and the environment. For those facilities that contain, or will contain, hazardous materials, continuous development and integration of safety analysis, as an integral part of design, is required. In other words, the fulfillment of safety functions by systems and structures becomes an integral part of fulfillment of project and mission functions.

The ISMS, along with the basic assumptions regarding quality and the specific requirements for the project, provide a framework under which the PEP and lower-tier documents such as implementation plans and procedures are developed. If the project is covered by an existing DOE site ISMS, then that governing site ISMS should be implemented within the project. If an existing ISMS can be used or modified to accommodate the project, then it is recommended that the project implement the site program through the PEP. If the project includes multiple companies, additional ISMS documentation may have to be developed to demonstrate organizational compliance with the specific project ISMS requirements.

### **3.1.1 Integrated Safety Management System**

An ISMS is a system designed to ensure that environmental, worker, and public safety is appropriately addressed in the performance of any task. A fundamental premise of ISM is

that accidents are preventable through early and close attention to safety, design, and operation, and with substantial stakeholder involvement in teams that plan and execute the project, based on appropriate standards. The ISMS consists of the objective, the guiding principles, the core functions, the mechanisms of implementation, clear responsibilities for implementation, and implementation. As such, an ISMS is characterized by a management system's ability to implement the seven guiding principles and five core management functions using the key implementing factors as described below.

To implement ISMS, the project needs to have a commitment to a standards-based safety program. Articulation of these objectives and principles is important, but not sufficient to achieve effective safety management. The challenge to establishing a standards-based safety approach in a project is to provide the rigor associated with the standards, yet provide the flexibility to apply a hazards-based tailored approach to defining the requirements. ISMS, as an integral part of project management, ensures that work processes related to design, testing, and construction are planned and executed with proper controls and with appropriate attention to safety.

The successful safety system functions effectively within safety mandates, considering budget and resource limitations. It enables tailoring so that hazards are identified and controlled, yet do not burden project phases with inflexible, prescriptive controls that needlessly inflate costs and constrain the project, and do not enhance safety. Thus, tailoring within project management functions (planning, analyzing hazards, establishing controls, performing tasks, assessing implementation, and providing feedback) will enable tasks to be managed at the appropriate levels. In effect, management systems function to optimize task planning and performance to enable those closest to the task—those who perform the task, those who manage or supervise the task, and those who will be affected by the results of the task—plan and assume responsibility for it.

To assure that planning and implementation provides a capital asset that facilitates safe operation and will not have open safety issues at project closeout, safety and environmental issues need to be identified and addressed early. Proper ISMS implementation ensures that the planning, design, and physical work are performed with proper attention to potential hazards, regardless of the type of activity being performed.

### **3.1.2 Integrated Safety Management Through Design**

Addressing safety issues early ensures that plans and designs for safety are integrated into the project. The goal is to ensure that safety is “designed in” early instead of “added on” later with increased cost and decreased effectiveness. Safety through design is not just meeting the specified safety requirements in the design; it is the project team taking specific proactive measures regarding safety. This includes making design changes to eliminate hazards, minimize hazards, mitigate consequences, and preclude events that could release

the hazard. Addressing hazards with a safety-through-design approach does not always require that systems, structures, or components be added that will prevent or mitigate the releases. Rather, it may involve removing or moving systems or changing design approaches that result in a safer facility and improved operations. It may also result in fewer safety class and safety significant controls being required in the final design.

For nuclear facilities, the recognition of anticipated hazards in the facility design requires special considerations. DOE has established the Safety Analysis Report or the Hazards Analysis Report as the preferred method for authorizing operation for its most hazardous facilities. The Safety Analysis Report also provides a critical feedback mechanism for the project. To assure integration of safety and design, the documents that support Safety Analysis Report preparation (e.g., Hazards Analysis Document, Fire Hazards Analysis, Emergency Response evaluations, etc.) need to be initiated early and developed along with the design. ISM provides the framework to provide continuous coordination between these two activities as necessary throughout the design process to ensure the final design meets both mission and safety requirements.

#### ***3.1.2.1 Objective***

The project objective is to systematically integrate safety into management, planning, and work practices at all levels and at all stages of the project so that missions are accomplished while assuring protection for the public, the worker, and the environment. This is accomplished through effective integration of safety management into all facets of project planning and execution, such that the overall management of safety functions and activities become an integral part of the project. The ISMS description needs to address the project roles and responsibilities for changing project teams and contracts during each project phase. Due to the changing need in each area, the PM needs to assure that appropriate coverage is provided on the IPT from these organizations on the IPT for each phase of the project.

#### ***3.1.2.2 Guiding Principles***

The ISM Guiding Principles and Core Functions provided in DOE P 450.4, Safety Management System Policy are required to be applied to ensure that safety is integrated into all phases of project planning and implementation. These principles as they relate specifically to project management, are:

- **Line Management Responsibility for Safety:** Project management is directly responsible for ensuring the facility structures, systems, and components, or the remedial activities recovery actions, protect the public, the workers, and the environment.
- **Clear Roles and Responsibilities:** Clear and unambiguous lines of authority and responsibility for ensuring safety is integrated into designs and remedial actions and are established and maintained at all organizational levels within the Department, the project, contractors, and suppliers.



- **Competence Commensurate with Responsibilities:** Project personnel need to possess the experience, knowledge (including project procedures and controls), skills, and abilities that are necessary to discharge their responsibilities. Capital assets, including those that contain or will contain hazardous material, require specific competencies including hazard analysis, accident analysis, safety system design, QA, facility construction, and facility operation and maintenance, which are tailored based on risk.
- **Balanced Priorities:** Programmatic, operational, and safety requirements need to be effectively fulfilled by facility features. Protecting the public, the workers, and the environment is a priority for all design, construction, modification, or remediation.
- **Identification of Safety Standards and Requirements:** The PM should assure the hazard evaluation process is initiated early and continued throughout the project. Before detailed design is performed, the associated hazards must be evaluated and an agreed-upon set of safety standards and requirements established which, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences of facility operation.
- **Engineered Controls Tailored to the Function Being Designed or Performed:** Engineering controls that are designed to prevent and mitigate hazards are tailored to the facility function or the remedial activity and the associated hazards.
- **Approval to Proceed:** Reviews (project, design, and independent) are performed to verify that safety has been adequately integrated into the evolving design before approval is given to proceed to the next design phase, procurement, construction, or operation.

### **3.1.2.3 Core Functions**

The expectations for an integrated safety management approach can be described by a successive set of actions or activities. This management system is modeled by the five core safety management functions, adopted in Table 3-1 to reflect the design process:

**Table 3-1. ISMS Operations to Project's Relationships**

<b>ISMS Operations</b>	<b>ISMS Projects</b>
Define the Work	↔ Requirements and Technical Scope of Work
Analyze the Hazards	↔ Analyze Potential Hazards
Develop and Implement Hazard Controls	↔ Develop Design Controls/ Requirements
Perform Work within Controls	↔ Perform Work/Design
Assessment and Feedback	↔ Review, Feedback, Improvement and Validation

The five core safety function relationships are illustrated in Figure 3-1. Although the arrows indicate a general direction, these are not independent, sequential functions.

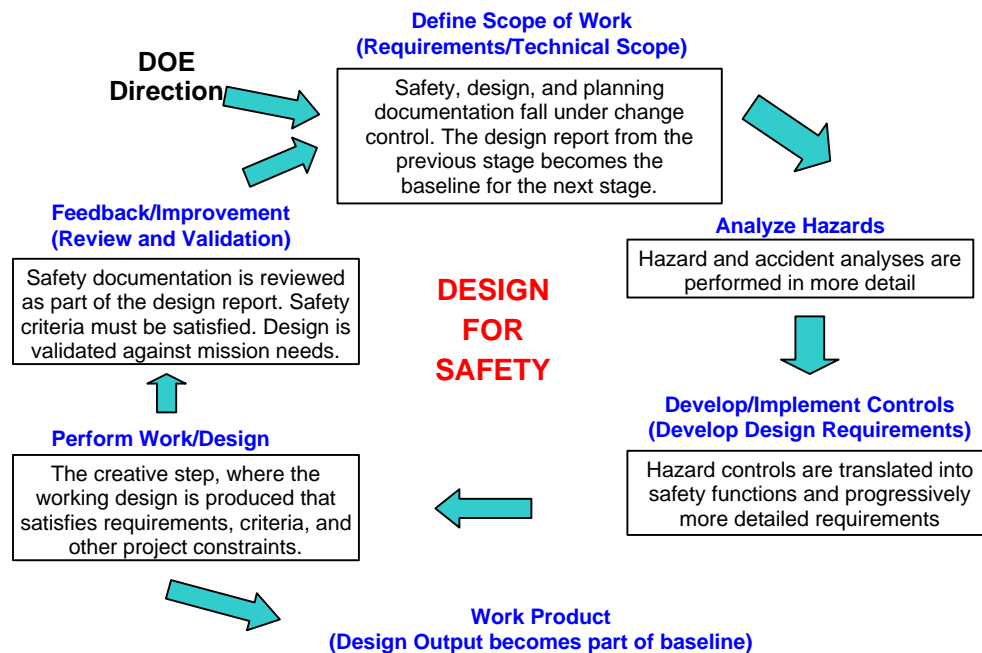


Figure 3-1. Safety Aspects in a Typical Design Stage

### *Requirements and Technical Scope of Work*

During each design stage, safety and design planning/documentation are progressively developed, become more detailed, and are placed under change control. The design/plan from a previous stage becomes the baseline for the next stage.

### *Analyze Potential Hazards*

Hazards and accidents are analyzed in progressively more detail in each stage. Safety analysts work closely with project engineers to develop a common understanding of the facility, systems, and processes, possible hazards including hazardous materials, and the envisioned operation of the facility.

### *Develop Controls/Requirements*

Hazard controls are translated into safety functions and progressively more detailed requirements affecting the project. Hazard analysis and accident analysis (if needed) will identify aspects of process and design necessary for safety, as well as systems that are

dedicated to the fulfillment of necessary safety functions. In addition to physical controls, administrative controls required to provide or support the safety functions are identified.

External constraints, such as laws, rules, codes, standards, and contracts are examined for their applicability. Relevant criteria and requirements are extracted and entered into the project-specific design manuals.

### ***Perform Work/Design/Plan***

While not always visible as a discrete function in the process, design, and planning, is the “creative” function of the process, where a working design/plan that will satisfy requirements, criteria, and other constraints is developed. The working designs/plans are committed to “paper” and assembled into a package that constitutes the output of this stage, and is approved under configuration (change) control.

### ***Review, Feedback, Improvement and Validation***

This function consists of unscheduled (lower-tiered) reviews and (upper-tiered) scheduled Critical Decision reviews. Safety design is specifically included in the review, and safety review criteria are established for each stage. The review criteria for earlier stages are reexamined in each stage to ensure corrective actions from prior reviews have been taken and those changes have not invalidated earlier reviews. For nuclear facilities, general criteria are identified for each stage of design and construction in the detailed description of each stage given in the Practices. These criteria should be adapted and used, as relevant, for specific projects. The process of developing the safety documentation (e.g., Safety Analysis Report) provides a valuable feedback and improvement mechanism for this function.

## **3.1.3 ISMS Implementation for Project Management Activities**

As previously described, ISM is an essential part of all project activities. The guiding principles and core functions of ISM should be used throughout each project. This section discusses applying ISM to key project activities: planning, design, technology development, construction, and facility disposition. To assure project execution planning appropriately addresses the interactions between the seven principles and five core functions, a crosswalk of guiding principles and core functions against implementation within the procedures and practices is helpful. This crosswalk provides a valuable tool for the PM and IPT to assure the implementation procedures address ISM functions and principles. A continuing focus of ISMS implementation is to assure that the stakeholders are fully and appropriately involved with the current phase of the project as well as detailed planning for the next phase.

### ***3.1.3.1 Project Planning***

Project planning should include early identification of potential hazards. For nuclear facilities, activities recommended in DOE G 420.1-1, Section 2 will be conducted at the

appropriate stages of the design. The PEP should address ISM implementation within the project. A proven principle of project planning is that the project be routinely evaluated to assure that all areas are fully integrated and that changes in one area are reflected in other areas. A valuable safety communications tool for projects with hazardous facilities (those categorized above Hazard Category-2) is the lower-tier safety analysis and documentation plan. The plan may be used to communicate the level of safety documentation that will be available at each critical decision point in the project. Early agreement by both the project and regulating body on the level of safety documentation by phase, supports project planning, but minimizes regulatory issues later in the project. The Practices provide an example of one of these plans and the level of documentation required for a relatively complex facility. For small, less complicated work scopes, safety planning may be effectively covered in the PEP.

### ***3.1.3.2 Integrating Safety with Design***

Delivering a facility or a modification that can meet its mission requirements while maintaining the safety of the public, workers, and the environment is essential for a successful project. For those facilities that contain, or will contain, hazardous materials, continuous development and integration of the safety analysis as an integral part of design is required. This is accomplished using ISM within design as described in Section 3.1.2. The task of developing the safety basis for the facility often drives design and operational requirements. The early integration of safety and design permits the development of timely and cost-effective solutions from the start, rather than as a crisis backfit at the end of the project. Providing a design that only meets all of the specified safety requirements may not be adequate to implement a safety-through-design approach.

### ***3.1.3.3 Project Authorization***

During the project phase there are clear, top-tier project hold points based on risk or hazards, for which an authorization to proceed is required. These top-tier project hold points are identified on the project's integrated schedule. Safety and environmental documentation support each of these authorization points. The authorization basis for the design phase for facilities with a DOE-STD-1027 categorization of Hazard Category-3 or higher will include a Preliminary Documented Safety Analysis/Preliminary Safety Analysis Report, the Safety Evaluation Report, and the feedback from independent design reviews. Authorization for facilities below Hazard Category-3 is based on a like document (e.g., Auditable Safety Analysis), which may be covered as part of a Health and Safety Plan. The results from these elements should be used to develop the basis for authorizing and completing design work. During the Execution phase, adherence to the approved Preliminary Documented Safety Analysis or Safety Analysis Report (or like documents) and enforcement of those requirements are key elements for authorizing construction work. Finally, the authorization basis for the startup activities should be completing the Safety Analysis Report/Documented

Safety Analysis/ Safety Evaluation Report required to satisfy issuance of an approved Documented Safety Analysis/Final Safety Analysis Report. Each of these authorizing documents, and the ISM description, need to be updated periodically (typically, at least annually) as a result of technical changes, budget changes, feedback from reviews, and execution/closeout issues. In addition, the documents reflect the development of the Documented Safety Analysis/Final Safety Analysis Report which only occurs in the later phases of new facility development. Hold points should be implemented at a lower “task” level to assure that proper attention has been placed on each of the potentially affected areas prior to the project critical decision points.

### **3.1.4 Safety Documentation and Project Support**

Timely development of safety documentation is critical to project implementation. As presented in Chapter 2, Figure 2-2 depicts the major stages of the project and the documentation needed to support each stage.

A key project element is the alignment of the requirements, the documentation, the facility, and the work practices associated with the facility throughout all project phases.

Critical roles for safety, following the design phase, are construction or remediation safety, testing and turnover activities, and ultimately, safety for the operations phase, which is not covered in this Manual.

#### ***3.1.4.1 Safety in Technology Development and Demonstration Activities***

Any activities associated with tests, experiments, proof-of-principle or technology development related to a project will also be carried out using the guiding principles and core functions of ISM according to DOE P 450.4. These activities are to be adequately planned, have hazards analyzed and controls implemented, be performed within controls, and have a review and feedback function.

#### ***3.1.4.2 Construction/Remediation Safety***

Construction/remediation safety is best implemented using the five core functions and the seven guiding principles of DOE P 450.4 and its implementing guide. To assure cost-effective implementation, plans need to be developed early as part of project planning and documentation. Hazards are to be analyzed and appropriate controls established to protect workers during the construction phase. These controls should be those specified by OSHA, plus any others needed to ensure safety. Safety programs ensure that construction activities are performed within controls. Finally, review mechanisms verify appropriate implementation of the construction safety program, and that the final project meets all requirements.

Preparation and use of installation/assembly procedures is an example of a valuable control. These procedures typically identify the methods of erection, special tooling/rigging, hold points and acceptance criteria. This planning/documentation ensures the task is thoroughly evaluated prior to proceeding. Involvement of all affected functions in the preparation of these procedures minimizes potential issues during construction.

Projects involving facility disposition activities should also use the guidance in DOE-STD-1120-98, "Integration of Environment, Safety, and Health into Facility Disposition Activities."

#### ***3.1.4.3 Testing, Commissioning, and Turnover Safety***

Testing, commissioning, and turnover safety is best implemented using the five core functions and the seven guiding principles of DOE P 450.4 and its implementing guide. During this phase, hazards are to be identified and evaluated, and proper controls established. Of particular importance are hazards associated with stored energy (pressure, temperature), electrical, fluid flow, and operating equipment. Of critical importance is controlling ownership of the facility (or portions thereof) during this phase. Knowing which portions of the facility have been turned over to operations and which portions have not is critical to maintaining safety during turnover. If a phased turnover is planned, special attention needs to be given to those structures, systems, and components that are in operation, and the interfaces with non-impacting structures, systems, and components.

## **3.2 ENVIRONMENT**

The principle for environmental integration is that PMs are committed to being stewards of the environment and execute projects in an environmentally sound and responsible manner. The scope of projects often involves handling, treating, storing, transporting, or disposing of hazardous, toxic, or radioactive material or waste. The Department is committed to complying with applicable environmental laws and regulations, and for being responsible in preserving and improving the quality of the environment. The Department demonstrates this commitment by integrating environmental safety, including pollution prevention, waste minimization, and resource conservation activities, into all projects. The Department also applies a tailored approach to environmental management to ensure a cost-effective, value-added approach to complying with environmental requirements and concerns. A key principle is that projects conduct all activities in a manner appropriate to the nature, scale, and environmental impacts of these activities, while maintaining compliance with applicable federal and state legislation and regulations. Specific implementation practices and requirements are described in Section 3.2.2.

### **3.2.1 Background**

International Standards Organization (ISO) 14001 principles have been effectively used by DOE sites and projects to implement an environmental management system as required by Executive Order 13148. ISO 14001 defines a framework for the system associated with most projects. The system is composed of the elements of an organization's overall management structure that address the immediate and long-term impact on the environment of its products, services, and processes.

### **3.2.2 Environmental Protection and Compliance**

Each project is to be implemented under a written environmental management process to anticipate and meet growing environmental performance expectations, and to ensure ongoing compliance with regulatory requirements. This management process may either be facility/project specific or a site-wide management system. Environmental management processes are discussed in Executive Order 13148, "Greening the Government Through Leadership in Environmental Management" and DOE G 450.4-1A, "Integrated Safety Management System Guide." The environmental baseline for a project is to be established prior to any work being performed at the work site. For remediation projects, the environmental baseline is typically provided as an integral part of the baseline risk assessment. Environmental baseline monitoring may be required considerably before beginning construction.

Implementation of an environmental management system may be through compliance with, and certification to ISO 14001, "Environmental Management Systems—Specification with Guidance for Use." In general, a project's environmental management system should achieve the principles noted below.

- Assess potential environmental impacts
- Assess legal and regulatory requirements
- Establish an appropriate life cycle environmental policy, including a commitment to prevention of pollution
- Determine the legislative requirements and environmental aspects associated with project activities, products, and services
- Develop management and employee commitment to the protection of the environment, with clear assignment of accountability and responsibility
- Encourage environmental planning throughout the project's life cycle for all project activities from planning through closeout
- Establish a disciplined management process for achieving targeted performance levels
- Provide appropriate and sufficient resources, including training, to achieve targeted performance levels on an ongoing basis

- Establish and maintain an emergency preparedness and response program
- Continuously evaluate environmental performance against policy, appropriate objectives and targets, and seek improvement where appropriate
- Establish and maintain appropriate communications with the customer and internal and external stakeholders
- Encourage and, as appropriate, require contractors and suppliers to establish an EM system or other type of written EM process.

Environmental considerations are part of most projects, regardless of the project type (e.g., design, construction, environmental cleanup, or facility startup). The IPT needs to understand the regulatory framework for the various environmental regulations—particularly those associated with environmental cleanup. Support to the IPT would normally include support from an environmental specialist. The typical steps each project needs to complete to ensure it meets its environmental stewardship commitment are outlined in Figure 3-2.

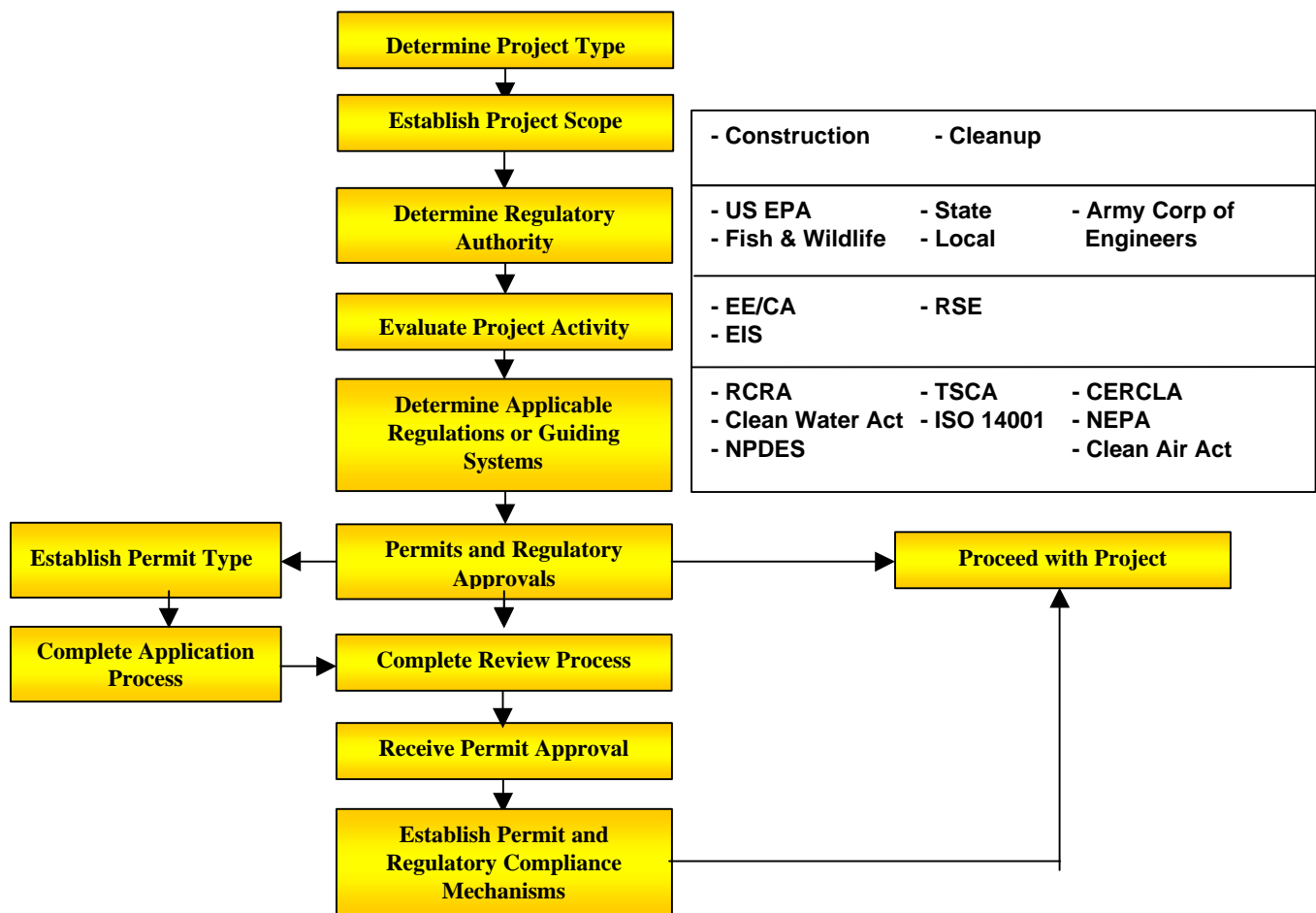
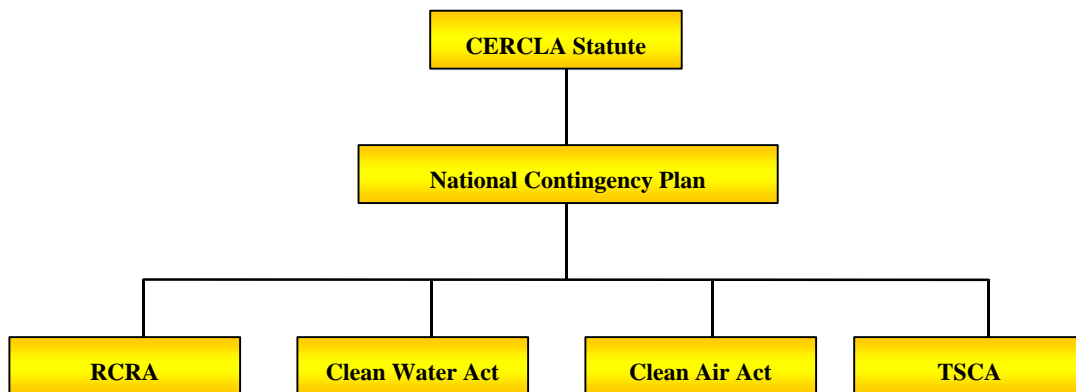


Figure 3-2. Typical Environmental Activities for DOE Projects



An example of one of the environmental regulations that may be applicable to the project is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA is guided by the National Oil and Hazardous Substance Pollution Contingency Plan, commonly referred to as the National Contingency Plan. This plan outlines the steps that will be followed in responding to situations in which hazardous substances, pollutants/contaminants, or oil are inadvertently released into the environment. The National Contingency Plan establishes the criteria, methods, and procedures that the EPA and other Federal agencies (including DOE) are required to use to determine priority releases for long-term evaluations and response.

The National Contingency Plan does not specify project cleanup levels or how a cleanup will be conducted. The National Contingency Plan relies on other regulations, (e.g., RCRA, Clean Water Act, and Clean Air Act) to provide cleanup levels and the framework for managing a CERCLA project site. Figure 3-3 outlines the CERCLA regulatory hierarchy.



**Figure 3-3. CERCLA Regulatory Hierarchy**

DOE projects may have additional environmental regulations that must be met. The NEPA process is an example of one such regulation. This process is a decision-making and planning tool for any DOE project that could have an environmental impact, not just environmental cleanup projects.

### **3.3 QUALITY ASSURANCE**

The PM is responsible to plan and implement a Quality Assurance Program (QAP) for the project and for assuring that along with safety, health, and environmental protection quality is integrated with the project. The line organizations are responsible for assuring the quality of the project. Quality Assurance (QA) begins at project conception and runs through design, development, construction, fabrication, operation, remediation, and decontamination and decommissioning. Quality affects cost, availability, effectiveness, safety, and impact on the environment. Therefore, appropriate aspects of quality assurance need to be given

careful consideration during the preparation of project documentation. This is accomplished when there is a recognized need to obtain the level of product and performance quality necessary to accomplish program objectives; provide reliability and continuity of operations, commensurate with Departmental responsibility for health and safety; and for the protection of personnel, the environment, and property.

- The PM is responsible for defining and assuring that effective implementation of required QA activities be established and implemented by the contractor.
- Line management is responsible for assuring compliance with quality implementing procedures and practices.

QA is mandated through the promulgation of an Order (414.1A) and a Rule (Title 10 Code of Federal Regulations [CFR] 830.120). The Order applies to all projects and facilities, and requires that both DOE and its contractors prepare and comply with an approved QAP. Title 10 CFR 830.120 (the Rule) identifies the top-level quality assurance requirements for establishing quality assurance programs for DOE management, operating contractors, and organizations performing work at or for DOE nuclear facilities.

The Order and Rule provide the basic areas to be covered by the project QAP. For nuclear projects, 10 CFR 830.120 and its attendant Price Anderson Act Program is to be implemented. For other programs, DOE Order 414.1A is to be applied.

10 CFR 830.120 and DOE O 414.1A have the same 10 basic requirements, subdivided into three sections. Successful implementation of these criteria can be summarized as follows:

#### A. MANAGEMENT

##### — Criterion 1 – Program

- A written QAP has been developed, implemented, and maintained.

##### — Criterion 2 – Personnel Training and Qualification

- Personnel have been trained and qualified for the task assigned and training is continuing.

##### — Criterion 3 – Quality Improvement

- Processes are in place to detect and prevent quality problems, control nonconforming items, identify cause and correction of quality issues, and provide for improvement.

##### — Criterion 4 – Documents and Records

- Documents are prepared, reviewed, approved, and issued to specify requirements or establish designs. Records are specified, prepared, reviewed, approved, and maintained.

## B. PERFORMANCE

### — Criterion 5 – Work Processes

- Work is performed to established standards and controls.
- Items are identified and controlled for proper use.
- Items are maintained.
- Instruments are calibrated and maintained.

### — Criterion 6 – Design

- Sound engineering standards and principles are being used in the design.
- Designs incorporate appropriate requirements and bases.
- Design interfaces are identified and controlled.
- Design adequacy has been or will be verified or validated by an independent group before the design is implemented.

### — Criterion 7 – Procurement

- Procured items and services meet established requirements.
- Suppliers are evaluated against specified criteria.
- Suppliers are routinely evaluated to assure continuing acceptability.

### — Criterion 8 – Inspection and Acceptance

- Inspection and testing are using equipment that has been calibrated and maintained to assure acceptance and performance criteria are met.

## C. ASSESSMENT

### — Criterion 9 – Management Assessment

- Managers routinely assess their processes.
- Problems that hinder achievement of objectives are identified and corrected.

### — Criterion 10 – Independent Assessment

- Independent assessments are planned and conducted to measure item and service quality, measure adequacy of work performed, and promote improvement.
- Independent assessments are performed by groups independent of the performers to assure the effective performance of responsibilities.
- Assessors are technically qualified and knowledgeable in the assessed areas.

### **3.3.1 Quality Assurance Program**

The QAP describes the overall quality management system and the project responsibility and authority for quality-related activities. The QAP covers the functional activities involved in the production of end items, products, and services.

Senior management demonstrates commitment and leadership to achieve quality through active involvement in the development and implementation of the QAP. Line management is responsible for assuring that line personnel are indoctrinated and trained to the requirements of the QAP Manual and the respective project procedures that implement quality requirements. Project personnel are responsible for achieving quality in the performance of their work activities.

The QAP identifies line management ownership of quality and provides for line management responsibility and involvement at all levels. It further recognizes the need to continuously assess and improve internal processes.

### **3.3.2 Quality Assurance Program Requirements**

The IPT prepares a QAP at the earliest possible stage. The QAP should address all applicable elements of either the Rule or the Order. Guidance is provided in DOE G 414.1-2 as to what should be considered in preparing the QAP to meet the Order and is also appropriate guidance for the Rule. The QAP is a living document, subject to review and revision as the project grows and matures. For example, when a project selects a contractor for the design the QAP will require revision to address the methods to be used to ensure the design agency is incorporating quality and quality requirements in design activities and deliverables.

The IPT should tailor the selected standards to the requirements of the project to assure an adequate level of control is applied to all project activities. This means that the project activities to be performed should be addressed, explaining the methods used to assure each activity is appropriately controlled.

The key requirements to be considered when developing the Project Quality Assurance Program area are included in the references identified in Appendix B.

### **3.3.3 Program Development**

Projects select an appropriate industry standard and tailor that standard to meet applicable Rule and Order requirements and the project requirements. For example, a nuclear facility construction project may select the American Society of Mechanical Engineers/National Quality Assurance Standard-1 (ASME/NQA-1) as an appropriate industry standard upon which to base the QA program and develop a cross-referenced matrix between the prepared NQA-1 program and the requirements of 10 CFR 830.120. Regardless of the standard

selected, a matrix of applicable project procedures to meet the selected industry standard and the Rule and Order requirements assures that all appropriate control aspects are in place. An important feature of the program is to carefully separate the project's nuclear aspects from the non-nuclear features due to Price Anderson Amendment Act considerations. Tailoring of QA requirements is discussed later in this section.

The QA program matrix is composed of implementing procedures from all aspects of the project. This means that implementing procedures such as procurement, engineering, test, safety, environmental, assessment, quality assurance, and others are identified in the matrix that makes up the project's QAP for the Project.

The Project QA organization supports the project at all levels, aiding in developing systems and procedures necessary to assure compliance with the applicable project requirements. The QA organization also provides an independent level of assurance, through audits, surveillance, and reviews, that the project, customer and regulatory requirements are being met. As a member of the project, QA supports the project effort to complete the project on time, within budget, and within requirements.

### **3.3.4 Implementation**

Quality program implementation occurs in phases. As early as possible (and no later than the beginning of conceptual design, the quality standard to be applied will have been selected and the QAP prepared. The QAP includes the quality program matrix identifying how applicable DOE standards will be met. The QAP and matrix identifies all of the controls required and provides details for implementing control features, including identification of those controls needing to be in place early. The remaining systems and procedures will be planned and scheduled for implementation prior to need. This means that procedures for the control of procurement activities, design, and construction will be developed and issued before those activities commence.

A critical step in the development of all these formal processes is the determination of how the quality requirements will be applied. Cost is a consideration as well as meeting quality expectations. For example, as soon as the radiologically significant components of the facility are identified, quality program planning should commence to assure that the appropriate quality controls are applied during design, procurement, fabrication, and testing. An essential component of tailoring quality requirements is categorizing facility systems and components. Early in the pre-acquisition stage, the project team should develop a method to categorize project systems, components, and activities based on such things as radiological, environmental, cost, and schedule impact. Existing site categorization systems should be considered and used where possible prior to creating new systems.

### **3.4 SOURCE DOCUMENTS**

DOE Orders provide requirements for specific activities, such as packaging and transportation (DOE O 460.1A and 460.2), worker protection (DOE O 440.1A), etc. The specific set of applicable laws and DOE Orders, Standards, Policies, Manuals, and Guides appropriate for implementing of safety, health, environmental and quality requirements are to be defined for each project. DOE Guides and DOE Standards support implementation of the Orders. The key source documents to be considered when developing and implementing the safety, environmental, and quality portion of the project management activities are listed in Appendix B, References. Some of these source documents provide hazard, task, or facility specific requirements.

### **3.5 SAFEGUARDS AND SECURITY**

Safeguards and Security (S&S) also an integral part of project planning and execution. S&S refers to the parameters of physical security that are built into a facility concerning access control, intrusion alarms, construction of vaults, property protection features, Operational Security (OPSEC) and even architectural surety. S&S requirements, when applicable, should be addressed early in the initial phases of a project and along with safety, quality and environmental protection, integrated throughout all project phases. The IPT should include S&S representation, if appropriate, and S&S should be confirmed and integrated by the PM. Life cycle cost analysis and overall system engineering should identify the requirements and costs for S&S during early project planning.

S&S should be considered and incorporated into all phases of a project, examples include:

- Preconceptual planning—draft a preliminary vulnerability assessment and initiate OPSEC considerations.
- Conceptual design should include a more detailed conceptual vulnerability assessment.
- S&S standards and requirements are incorporated into the design criteria, specifications and drawings.
- Construction and testing should address and confirm S&S design requirements.

Plans and considerations related to S&S should be included as part of the PEP and may affect other components of the PEP, such as emergency preparedness planning, communications, and procurement planning.

# 4

## INITIATION

The project Initiation phase includes activities and actions that occur during the early stages of project planning, including prior to Critical Decision-0, Approve Mission Need. Initiation includes early planning, mission need identification and justification, IPT organization, initial acquisition strategy, pre-acquisition design, and other. During project Initiation and early planning, the requirements and capabilities are defined and developed. Typically, the outputs and deliverables will include:

- Mission need documentation
- Initial acquisition strategy
- Identification of the Program Manager
- Identification, if possible, of the PM
- Identification and organization of the IPT
- Functional, operational, or technical requirements
- Request for Critical Decision-0, Approve Mission Need.

These efforts support the development of early project technical, scope, schedule, and cost ranges to converging on a technical solution. This work provides a means to communicate and obtain agreement on the overall scope for the project.

### 4.1 MISSION NEED STATEMENT

During Initiation planning, a need that cannot be met through non-material means is identified through the strategic and programmatic planning efforts of the program office. While any office may propose a mission need, all mission needs must be within the approved program and in consonance with the Department's Strategic Plan.

Preparation of the Mission Need Justification document is the first step in pre-conceptual planning activities and the project acquisition process. Pre-conceptual planning activities focus on the program's strategic goals and objectives, consistent with the Department's strategic goals, plans, and objectives. The Program Manager directs the project planning and execution roles for projects assigned by the PAS/AE. The Program Manager also initiates definition of mission need based on input from field locations and the program office and oversees the development of project definition, scope, and budget to support mission need. The MNS and associated justification should be tailored commensurate with the cost, risk, and complexity of the project.

**The MNS and justification shall be developed for all projects having a TPC greater than \$5 million.** This is the result of the strategic planning process which identifies the

goals and objectives for programs and the capabilities required to attain those goals and objectives. The Mission Need Justification provides the written rationale for a specific capability that the Department currently lacks to meet to execute its assigned mission. Approve Mission Need (Critical Decision-0) provides approval for a proposed project to proceed. Once Critical Decision-0 is approved, the project must be included in the Department's program management and reporting systems.

This early phase is generally a continuing process, and normally begins with a review of the latest strategy and multi-year plans. The information is incorporated into an assessment of current and projected capability that is required by the various Programs to accomplish assigned missions. The process may also begin with the identification of opportunities to exploit technological breakthroughs that provide new capabilities to address established needs, reduce ownership costs, or improve the effectiveness of current equipment, facilities, or systems. The mission need analysis identifies the time-based nature of the need and the specific timeframe the need is expected to exist. Identified deficiencies or potential needs should be evaluated and assessed across all programs for solutions. Non-capital solutions should also be considered, and if the need can be fulfilled by a non-capital solution, the need should be referred to the appropriate DOE component for action.

The description is to be defined in terms of mission, objectives, and general capabilities—not in terms of equipment or system specific performance characteristics. That information will be provided during the Definition phase of the project. Input on needed timing and priority, relative to other already established MNSs, is also required.

## **4.2 MISSION NEED STATEMENT AND JUSTIFICATION FORMAT AND CONTENT**

The Mission Need Justification may be tailored to suit the size, risk, and complexity of the project. A brief statement explaining why an element is not applicable to a project is required. The Mission Need Justification should focus on quality rather than quantity. The Mission Need Justification should document the IPT's consideration of the following required elements in this recommended format:

### **MISSION NEED JUSTIFICATION FOR:**

Concurrence Signatures: These must include, at a minimum, the Program Manager, CO (approved by the Director of Procurement), and line of authority up to the approving official.

Project Title:

Lead Program Office:

Total Project Cost Range:



(A) Acquisition Background and Objectives

1) Statement of Need

Describe the general technical, schedule and cost range parameters of the project scope and definition. Describe how the project fits within the mission of the Program Office and why it is critical to the overall accomplishment of the mission of the Department, including the benefits to be realized.

2) Applicable Conditions

State all significant conditions affecting the project, such as requirements for compatibility with existing or future systems and any known cost, schedule, and capability or performance constraints.

3) Interfaces

Describe interfaces with other DOE organizations, National Laboratories or outside stakeholders. When a site is subject to the requirements of DOE Acquisition Letter 2000-08 of August 18, 2000, requiring Site Utilization and Management Plan, the Mission Need Justification must be consistent with that Site Plan.

4) Integrated Project Team

Identify the IPT members, functions and contact data for the proposed project.

5) Development Plan

Summarize the previous planning activities, which have occurred to date. List the activities and schedule for reaching the major milestones (Critical Decisions) including planned dates to submit the AS, Risk Management Plan (RMP), PEP, and the estimated date for the Critical Decision-1 ESAAB.

(B) Document the IPT's consideration of the identification and discussion of each possible alternative course of action with trade-offs, and the pros and cons for each alternative matrixed across the risk elements listed below. Explain the influence of each issue in structuring the project, for each alternative considered. Each possible alternative should include, in addition to a new capability, the use of similar facilities and capabilities at other sites, modification, upgrade, or renovation of existing space, and rent space, among others. Each possible alternative should also include the alternative of doing nothing. DOE directly manage the project, DOE direct contract with a construction manager, M&O/M&I contractor manage the project, a combination DOE/private sector manager and other Federal agency manager.

1. Project scope and definition
2. Environmental, Safety and Health
3. Cost and Schedule range (w/levels of confidence)
4. Project funding range and budget management
5. Technology status and engineering

6. Project interfaces and integration requirements
7. Safeguards and security
8. Project location and site conditions
9. Legal and Regulatory assessment
10. Stakeholder issues

The PAS is responsible for performing a mission validation IPR on all MS projects. This is a limited review of the project prior to Critical Decision-0. It validates the mission need and the funding request. An IPR may be conducted as appropriate to assist in the Critical Decision-0 on Other Projects over \$5M. The SAE/AE will have all this material for consideration in making Critical Decision-0.

### **4.3 CRITICAL DECISION-0, MISSION NEED STATEMENT APPROVAL**

All Critical Decision-0 submissions are preferred to be in electronic format (MS-Word) and sent to: ESAAB.SECRETARIAT@hq.doe.gov at least 3 weeks prior to any scheduled decisional briefings. A hard copy should be sent to OECM. OECM will coordinate with the Office of Program Analysis & Evaluation for assessment on all MNSs and associated justification documents, and the Office of Program Analysis & Evaluation will provide a recommendation to the appropriate approving official. All mission need justifications are to be submitted for assessment through the appropriate Assistant Secretaries/PAS before requesting approval of the Under Secretary or Deputy Secretary. The Program Office, prior to final approval by the Assistant Secretaries/PAS, should submit the MNS and justification for projects having a TPC between \$5M and \$20M to OECM/for OMBE. The MNS will be approved by the Deputy Secretary for projects having a TPC of \$400M or higher, by the Under Secretaries for projects having a TPC under \$400M to \$20M, and by the Assistant Secretaries/PAS for projects having a TPC under \$20M to \$5M. This decision may not be further delegated.

### **4.4 PROJECT MANAGER AND THE INTEGRATED PROJECT TEAM**

As early as practicable prior to Critical Decision-1, a PM is to be assigned to the project. The PM should have the necessary training, skills, and experience for success. When assigned, the PM should assume responsibility and accountability for the project. The PM should also be formally delegated the authority to successfully manage the project. This is documented in the project charter.

The selection of the IPT should be led by the PM. However, when the PM has not yet been identified, the team should be formed by the Program Manager. Depending upon the project, the IPT should include legal, quality, safety, environmental, and technical personnel. In all cases, the IPT will include a CO. All IPT actions and activities are performed under the

direction of the PM. IPT members should be assigned for the length of time required to complete their IPT assignments.

The PAS should prepare and issue a charter to the IPT. The charter identifies team members, roles and responsibilities, authorities and line of authorities, IPT operating methods, and procedures, communications, decisions, correspondence, and reporting. The charter should be included in the PEP.

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# 5

## DEFINITION

The Definition phase involves those activities which, starting with an approved Mission Need, define the concepts and range of alternatives to be considered for the project. This culminates with a recommended alternative that includes a mature RMP, AS, requirements definition and conceptual design. These activities establish the foundation that forms the basis for design, engineering, and execution. Changes in the plan and the concept occurring after the Definition phase will increase the risk as well as the cost and schedule. The following sections discuss the various components and products of the Definition phase.

### 5.1 CONCEPTUAL DESIGN

The scope of the conceptual design effort is dependent on the type of project being planned. Concept design may require research, development, testing and other efforts which will contribute information to the conceptual design. A formal value management analysis is required for all projects having a TPC greater than \$5 million. Value management should be employed as early as possible in the project development and design process so recommendations can be included in the planning and implemented without delaying the progress of the project or causing significant rework of completed designs. Early phases of capital asset acquisition yield the greatest cost reductions.

#### 5.1.1 Requirements Analysis

The requirements analysis process develops the programmatic, system, functional and/or technical requirements over the various project phases for hardware, software, facilities, personnel, procedures, technical data, personnel training, verification matrices, spares, repair parts, and consumables needed to acquire, test, deploy, operate, and maintain a system. Requirements analysis serves as one of the primary processes for program planning, future requirement analysis, trade studies, and other considerations.

These requirements define the systems engineering and design basis for the project. Requirements define and describe the extent to which a function(s) is to be executed, and are generally measured in terms of quantity, quality, coverage, timelines, safety, environmental, products. The requirements documentation provides the traceability from final test and operational performance back to mission need. It is a vital element in maintaining the connection between the mission need and the final capability.

The requirements identification process begins in the project Initiation phase with the development of the MNS. The MNS documents the requirement for a specific capability,

defined in terms of performance. Upon approval the project proceeds to concept exploration, conducting Research & Development, prototyping, technology demonstrations and other activities necessary to analyze alternative and select the appropriate alternative(s). During these activities, analysis and documentation of the requirements is accomplished.

**Each project shall document the requirements that form the basis for the design and engineering phase of the project and be delivered and approved at Critical Decision-1.**

The earlier in a project's life cycle project requirements can be identified and defined, the more effectively and efficiently a project will progress through the various project phases, and meet project baselines, agreements, and commitments. As a project progresses from mission need through concept exploration, development, and design, the process of identifying, analyzing, and refining requirements is continual and is always traceable to specifications and designs. Once approved, the requirements document (RD) becomes part of the baseline and is to be controlled through the change control process as with all baseline information.

Requirements identification and definition can originate from many sources, including:

- The MNS and requirements;
- Strategic plans and objectives;
- Legal agreements between the DOE and individual States and the EPA;
- National Codes and Standards;
- DOE Orders, Manuals and Standards;
- Background and knowledge of project personnel;
- Lessons learned from other projects;
- Research and development activities as well as pilot plant and full-scale testing;
- Industrial organizations and industry experts; and
- Other organizations such as the Defense Nuclear Facilities Safety Board, citizen's groups, and stakeholders.

As the requirements for a specific project are identified and defined; and as a project progresses, some of the requirements may not be essential to the core capability, statute, codes and standards, and Department directives. Although the other requirements are non-mandatory or non-essential, it is prudent to carefully evaluate each non-mandatory requirement to determine its usefulness and appropriateness prior to determining whether or not it should be included into the designed implemented capability. A project may choose to further develop additional requirement documents due to the complexity of project or the maturity of the requirements.

#### ***5.1.1.1 Requirements Definition***

As a project progresses through its life cycle phases, the requirements evolve into increasing levels of detail and specificity.

- Performance or System Functions, are where the overall functions and capabilities are specified or stated. At this early stage, the function statements address the areas of programmatic mission, safety, environment, and other necessary general functions. For large systems/facilities projects, when taken collectively, the functions should describe comprehensively how those systems contribute to the overall operation of the project as required by the MNS. This is generally the highest level and is set early in a project and tightly controlled due to their overarching coverage.
- System Functional Requirements result from the Performance/System Functions. These requirements statements include sufficient detail to establish the acceptance criteria or limits against which the actual performance capability of the as-built or remediated system can be evaluated. These requirements are broad enough so that numerous “designs” may meet them, and they may appropriately represent different concepts or alternatives. When adequately done, these may be employed to allow multiple competing alternative solutions when the Department wishes to maintain competition between solutions, or to allow competing solutions to remaining viable.
- Subsystem and Component Requirements are specific requirements required of both an item and any interfacing items. They provide the individual specification required of the subsystem or component that are necessary for the item to appropriately support the larger system. They may or may not give the general details required for fabrication.
- Specific Standards, which includes the Codes, Standards, Regulations and needed discipline (Electrical, mechanical, nuclear, fire, RadCon, etc.) requirements to procure, fabricate, construct, inspect and test the components, subsystems, and systems. They are generally detailed in individual specifications or drawing, however, some provide broad coverage, like a piping or building code which may be specified at a high level, but is to be carried through to the lowest level.

#### ***5.1.1.2 Types of Requirements Documents***

DOE-STD-3024-98, which has been developed as a standard for bringing together the requirements of nonreactor Hazard Category-2 facilities, may be useful for others in a tailored fashion. The type of RD that may be presented at Critical Decision-1 will depend on the complexity of the project, technology maturity, and other factors. Regardless, the RD forms the basis for project development, engineering, and implementation. These are not all performed at the same time during the project life cycle. Types of RDs that may be used include:

- Program RDs. Typically employed when a program (or program which contains acquisition projects) needs to provide overall requirements integration across multiple programmatic activities and projects.
- Functional RDs. May be used to define functional capability when the project desires an unconstrained solution. This is normally employed there are multiple competing alternative solutions and the Department wishes to maintain competition between the solutions.
- System RDs. May be used for systems where the complexity is high and a significant systems engineering process is to be conducted to arrive at a definitive system solution and design.
- Technical RDs. Commonly used for projects where the solution is constrained; there are little or no technological issues, or there are stringent technical constraints and requirements.

### 5.1.2 Conceptual Design Report

The CDR or the equivalent for non-system projects documents the outcome of the conceptual design effort and forms the basis for the order of range estimate and is the basic document for a Critical Decision-1 request. The CDR is often the first technical document presented to senior management to obtain support, sponsorship and inclusion in a budget request. **CDR shall clearly and concisely describe the alternative selected (scope, system/plant or facilities), how it meets the MNS, the functions/requirements that define it, and demonstrate the capability for success.**

Elements of the CDR should include on a tailored basis:

- A project description containing an overview of the proposed project (design or characterization) and a synopsis of the development activities. In remediation projects, the report is a combination of applicable regulations and characterization.
- A schedule and cost baseline (including resource loading) for preliminary and final design that serves as a basis for a request for PED funding and performance evaluation
- An alternatives analysis including life cycle costs, operational considerations, site development considerations, relationships to other site activities, and the comparison of alternatives, their risks, and the determined preferred alternative. Life cycle costs are to include decontamination and demolition, transition (personnel and equipment moves), utilities, and maintenance including comparisons that incorporate a review of research and development and/or technology development challenges that are presented by the selected alternative.
- A Preliminary Safeguards and Security Plan



- Preliminary design and analysis calculations including the facility(ies) required to respond to the MNS
- A draft PEP
- The summary test and acceptance criteria
- A project WBS and dictionary
- Facility condition assessments if the project is upgrading existing facilities. These assessments may confirm the suitability of facilities for the proposed action.
- A draft waste minimization/pollution identification and prevention plan, and a Waste Management Plan including control, storage, treatment, and disposal
- A draft Decontamination & Decommissioning Plan, if required
- Assessments of and strategy for:
  - NEPA: the level of NEPA documentation required and the plan for completing these documents in support of the proposed project schedule.
  - Safety: the level of safety documentation required for the project, and the plan for completing these documents in support of the proposed project schedule. An initial Hazards Assessment and/or Preliminary Safety Analysis.
  - The safeguards and security considerations for the project.
  - Site selection: the application of a coherent, defensible methodology to identify and evaluate site options.
  - Waste management: decontamination and decommissioning plans where appropriate and applicable; waste minimization efforts.
- Public and/or stakeholder input (where appropriate)
- Preliminary Interface Control Documents
- Finalized system requirements and applicable codes and standards for design, procurement, construction, or characterization (where appropriate)
- Site selection criteria and site surveys/site evaluations
- Anticipated/expected project products/deliverables (project end-state)
- Known and anticipated project constraints
- Conceptual design drawings/renderings/calculations (as appropriate)
- Initial planning for testing, turnover, RA, or ORR
- Design alternatives
- A vulnerability assessment
- A draft plan for project Execution phase activities (PEP)

- Draft System Design Descriptions, if appropriate
- A preliminary plan demobilization and/or disposal of facilities being replaced.

## 5.2 ACQUISITION STRATEGY

A summary stand-alone AS is required for all projects with an estimated TPC over \$5M regardless of whether the project will be executed through an M&O/M&I contractor or directly by the Department. The purpose of this requirement is to document overall project planning. The AS focuses on the overall project, which may require many individual contracts. Approvals of MNSs and ASs do not waive any appropriate approvals required by the Office of Procurement and Assistance Management for specific contract clearance purposes.

**A comprehensive AS shall be developed for each project in accord with this Manual, be integrated with the risk analyses, and evaluated by OMBE prior to approval by the designated approval authority.** For projects having a TPC of \$400M or greater, the AS is approved by the Deputy Secretary. For projects having a TPC between \$20M to \$400M, approval is by the Under Secretaries. The PAS approve ASs for projects having a TPC between \$5M and \$20M. The AS is prepared by the IPT as early in the project life cycle as practicable. The AS should be consistent with the Site Plan. The completed, approved, and issued AS is a living document, maintained under change control (see Section 2.7), however, once the APB is approved and the PEP issued, it is not generally necessary to maintain the AS, unless material changes occur, in which case it should be updated and reissued.

The AS outlines the process by which the efforts of all personnel responsible for significant portions of an acquisition are coordinated and integrated. The fundamental purpose of an AS is to ensure that the Department meets its needs in the most effective, economical, and timely manner. In developing the AS, the IPT may review previous plans for similar acquisitions and discuss them with the key personnel involved in these acquisitions to obtain maximum advantage of lessons learned. The AS is generally reviewed annually, until the PEP is fully approved and guides the project. If acquisition changes occur, and if they are material, then an update of the AS should be performed.

The following guidelines should be considered, and as appropriate, reflected in the completed AS:

- As applicable, tailor the AS to meet project requirements, depending upon cost, complexity, and schedule of the procurement. This may be most easily done by minimizing requirements of detail and consolidating topics, appropriately.
- Identify needs, develop specifications, and solicit offers in such a manner as to promote and provide full and open competition. When full and open competition is not required, solicit offers to assure maximum competition considering the goods and services being

acquired. Address make-buy decisions for any research or technology development that is required involving sites, laboratories, or subcontractors.

- Encourage offerors to supply commercial items. To the extent suitable, if commercial items to meet the DOE needs are not available, provide non-developmental items in response to solicitations.
- Develop and document risk comparisons and risk reduction strategies
- Assure sufficiently trained and capable personnel are available to analyze and evaluate proposals.
- Ensure that no purchase request would result in a contractor performing an inherently governmental function.
- Ensure that all contracts are adequately managed to verify effective management and control of contractor performance.
- Assure knowledge gained from prior acquisitions is used to better refine requirements and acquisition strategies. Especially the use of performance-based contracting and fixed-price contracting.
- Structure purchase requests to:
  - Facilitate competition by and among small business concerns.
  - Avoid unnecessary and unjustified bundling that precludes small business participation.

An essential part of project planning is to ensure that the risk elements associated with the project have been identified, analyzed, and determined to be either eliminated, mitigated, or manageable. Risk identification and analyses should be continued through the succeeding stages, including the AS and the PEP. Each of the identified risks is monitored at future Critical Decisions and review points to ensure that they have been satisfactorily addressed, eliminated, mitigated, or managed.

The AS describes the IPT's approach for the successful acquisition of the project and documents the rationale for that approach for the AE's decision to proceed with projects above \$5M. When DOE executes the PM functions the IPT will include, as a minimum, the DOE Program Manager, DOE PM (once assigned), and a DOE CO (approved by the Director of Procurement). The IPT membership is approved by the appropriate SAE or AE. Led by the Federal program or project manager, the IPT includes other DOE functional areas such as budget, financial, legal, safety, and contracting. DOE Federal officials normally develop the AS. The IPT may review previous ASs for projects that are similar, and discuss them with the key personnel involved to obtain maximum advantage of lessons learned. M&O/M&I contractors may be consulted during the development of the AS when

DOE executes the PM functions directly, if those contractors are not potential competitors for the contracts.

For projects the M&O/M&I contractor executes the PM functions, the DOE CO is to ensure that the contractor's procurement system requires written ASs and contract acquisition plans appropriate for the requirement and dollar value of each project and contract, and consistent with the intent of this Manual.

Additional AS information is presented in the Practice on Acquisition Strategy Planning.

### **5.2.1 Acquisition Strategy Format**

The MNS and justification (CD-0) will have identified the conceivable range of acquisition alternatives. The AS should be a logical extension narrowing the range of acquisition alternatives to the one or set best suited to the project. Each AS is prepared pursuant to the following elements with the understanding that some elements listed may not apply in all instances. The AS may be tailored to suit the size, risk, and complexity of the project. Tailoring is in the degree of detail, based on the project's size, risk, and complexity, not in omitting the requirements altogether. A brief statement in the AS explaining why an element is not applicable or tailored to a project is required for the SAE/AE. The AS should focus on quality rather than quantity.

The AS should document the IPT's consideration of the following required elements and recommended format:

#### **ACQUISITION STRATEGY FOR:**

Concurrence Signatures: These must include, at a minimum, the DOE PM, CO, and line of authority up to the approving official. It is recommended that all members of the IPT sign the AS. The Director, Office of Engineering and Construction Management (OECM)/for the OMBE will review and concur on all ASs having a TPC greater than \$5M and provide a recommendation to the appropriate approving official.

Project Title:

Lead Program Office:

Total Project Cost Range:

Acquisition Background and Objectives.

#### **(1) Statement of Need**

Describe the general technical, schedule and cost range parameters of the project scope and definition, including the proposed location of the project site and project size. Describe how the project fits within the mission of the Program

Office and why it is critical to the overall accomplishment of the mission of the Department, including the benefits to be realized.

(2) Applicable Conditions

State all significant conditions affecting the project, such as requirements for compatibility with existing or future systems and any known cost, schedule and capability or performance constraints.

(3) Interfaces

Describe interfaces with other DOE organizations, National Laboratories or outside stakeholders. When a site is subject to the requirements of DOE Acquisition Letter 2000-08 of August 18, 2000, requiring a Site Utilization and Management Plan, the project must be consistent with that site plan. Discuss the impact of this project and its associated contracts and how coordination among programs/projects at the site has been considered for the attainment of the site's mission.

(4) Integrated Project Team

Identify the IPT lead and members. The IPT is led by the Federal program or project manager. The IPT includes other DOE functional areas such as budget, financial, legal, safety, and contracting. Describe each member's functions, roles and responsibilities, line and matrix reporting relationships, and contact data for the proposed project. List the individuals who participated in preparing the AS.

(5) Mission Need Justification (Critical Decision-0)

List the date the Mission Need Justification (Critical Decision-0) was approved by the approving official and the Critical Decision-0 TPC range. Summarize any cost and schedule ranges and scope variances from the approved Critical Decision-0 and the supporting rationale. Discuss any Critical Decision-0 approval notes and how they were dispositioned.

(6) Total Project Cost Range

List the TPC range which tracks to the Budget and summarize the supporting rationale. Identify and discuss cost differences between the Budget and the AS. TPC consists of all the costs included in the Total Estimated Cost of a construction project plus the pre construction costs, such as conceptual design and research and development, as well as the costs associated with the pre operational phase, such as training and startup costs. Discuss related cost concepts to be employed, as appropriate, as follows:

- (i) Discuss how life cycle cost will be considered and the cost model used to develop the estimate.
- (ii) Describe the Design-to-cost objective(s) and underlying assumptions. Describe how objectives are to be applied, tracked and enforced.

(iii) Describe the application of should-cost analysis to the project.

(7) Capability or Performance

List milestones and expected performance results that track to the Budget.

(8) Delivery or Performance Period Requirements

Summarize the basis for establishing the performance milestones. Explain and provide reasons for urgency if it results in concurrent design, development or construction. List performance periods that track to the Budget or identify differences.

(9) Trade-offs

Summarize the pros and cons of alternative acquisition approaches used to down select from Critical Decision-0 to Critical Decision-1. The AS should be a logical extension of the alternatives identified at Critical Decision-0 narrowed to the one plan or set best suited for satisfying the mission need in the most effective, economical, and timely manner. Each conceivable alternative course of action should include, in addition to new construction, use similar facilities at other sites, renovate existing space, rent space, and so forth. Each conceivable alternative would also include do nothing, DOE directly execute the PM functions, DOE direct contract with a construction manager, M&O/M&I contractor execute the project manager functions, a combination DOE private sector project manager and other Federal agency project manager. Discuss the expected consequences of trade-offs among the various cost, capability or performance and schedule goal ranges.

(10) Risks (i.e., range of risk elements discussed in Critical Decision-0)

Summarize technical, cost, and schedule risks identified and analyzed to date and describe what efforts are planned or underway to manage, monitor, reduce or eliminate risks and the consequences of failure to achieve goals. The major types of contracts proposed should be based on this comprehensive risk analysis.

(11) Acquisition Streamlining

Discuss plans and procedures to encourage industry participation by using draft solicitations, pre-solicitation conferences and other streamlining initiatives.

(B) Plan of Action

(1) Sources

Indicate the range of prospective sources of supplies and services that can meet the need. Include consideration of small business, small disadvantaged business, and women-owned small business concerns. Address the extent, results and planned market research.

(2) Competition

Discuss the methods of competition that will be sought, promoted, and sustained throughout the course of the project. If full and open competition is not contemplated, discuss the basis of the application of that authority; identify the source(s) and summarize the decision why full and open competition cannot be obtained. If there are known barriers to increasing competition, address how to overcome them.

(3) Source-selection Procedures

Discuss general source selection procedures, including the estimated timing for submission and evaluation of proposals and a general discussion of pre qualification and evaluation factors.

(4) Contracting Considerations

For each major contract contemplated discuss the contract type selected; special contract method alternatives, e.g., design build, design negotiate build; special clauses (e.g., Value Engineering) or deviations required; whether sealed bidding, negotiation, or best value will be used and why; and lease or purchase decisions.

(5) Budgeting and Funding

Explain how budget estimates were derived and the schedule for obtaining adequate funds at the time they are required. Explain any differences from the Budget.

(6) Product or Service Descriptions

Explain the choice of product or service description types (e.g., design specifications, performance-based contracting descriptions) to be used in the acquisitions.

(7) Priorities, Allocations and Allotments

Specify the method of obtaining and using priorities, allocations and allotments and the reasons for them, if applicable.

(8) Contractor vs. Government Performance

Address the consideration given to OMB Circular A-76.

(9) Inherently Governmental Functions

Address the consideration given to OFPP Policy Letter 92-1.

(10) Management Information Requirements

Discuss, as appropriate what management system will be used by the Government to monitor the contractor's effort, e.g., earned value management system. Discuss Federal staffing, skills and structure that will be required to manage the project.

The industry standard for project control systems described in American National Standards Institute (ANSI) EIA-748, Earned Value Management Systems, must be implemented on all projects with a TPC greater than \$20M for control of project performance during the project Execution phase.

Cost and schedule performance, milestone status, and financial status must be reported to DOE on a monthly basis using DOE-approved Work Breakdown Structure (WBS) elements and data elements for all projects having a TPC greater than or equal to \$20M, except for time-and-materials contracts, firm fixed-priced contracts, or level-of-effort support contracts for control of project performance during the project Execution phase. The report must also include variance analyses and corrective action plans that integrate cost, schedule, and scope if variances exceed DOE-established reporting thresholds. Also reported will be analyses of cost and schedule trends, financial status, and baseline change control activity, including the allocation of management reserve, potential problems, and critical issues.

(11) Test and Evaluation

To the extent applicable, describe the test program of the contractor and the Government for each major phase of the acquisitions.

(12) Logistics Considerations

Discuss the assumptions determining contractor or agency support over the life of the acquisition, including computer aided acquisition systems, maintenance and servicing, and other technical considerations.

Describe the requirements for contractor data and data rights, their estimated cost and the use to be made of the data.

Describe the reliability, maintainability and quality assurance requirements including any planned use of warranties.

(13) Government-Furnished Property

Indicate any property to be furnished to contractors, including material and facilities, and discuss any associated considerations, such as availability or the schedule for its acquisition.

(14) Government-Furnished Information

Discuss any Government information such as manuals, drawings, and test data to be provided to prospective offerors and contractors.

(15) Environmental and Energy Conservation Objectives

Discuss applicable environmental and energy conservation objectives.



Discuss the applicability of an environmental assessment or environmental impact statement, the proposed resolution of any environmentally related requirements to be included in solicitations and contracts.

(16) Security Considerations

For acquisitions dealing with classified matters, discuss how adequate security will be established, maintained, and monitored.

(17) Safety Requirements and Considerations

Describe Environment, Safety and Health requirements, including applicability of an Integrated Safety Management System.

(18) Contract Administration

Describe how the contract will be administered, including roles and responsibilities for inspection, acceptance, validation, and verification of performance.

(19) Other Considerations

Discuss any other matter germane to the plan not covered elsewhere.

Show the square footage of each new construction project and address the elimination by transfer, sale, or demolition of excess buildings and facilities of equivalent size by site. This excess reduction to new construction formula does not apply to environmental management closure sites.

If applicable, sustainable building design principles must be applied to the siting, design, and construction of new facilities.

(20) Milestones for the Acquisition Cycle

Address the expected sequencing of major contracts and their major steps, e.g., contract acquisition plan approval, issuance of synopsis, issuance of solicitation, evaluation of proposals, negotiations, and contract award. List long lead procurement items with a capital funds budget request and the acquisition strategy for obtaining them, if applicable.

### **5.2.2 Submission of the Acquisition Strategy**

All AS submissions for Critical Decision-1 are preferred to be in electronic format (MS-Word) and sent to: ESAAB.SECRETARIAT@hq.doe.gov at least 3 weeks prior to any scheduled decisional briefings. The OECM serves as Secretariat for the ESAAB. A hard copy should be sent to OECM. All ASs are to be submitted to the OECM/for OMBE review and concurrence. A recommendation must be made by OMBE to the appropriate AE approving official through the appropriate Assistant Secretary/PAS before requesting approval of the Under Secretary or Deputy Secretary. OECM will concur and provide a recommendation to the appropriate approving official via a memo. The Program Office,

prior to final approval by the AS/PAS, should submit ASs for projects having a TPC between \$5M and \$20M to OECM or OMBE. The AS will be approved by the Deputy Secretary for projects having a TPC of \$400M or higher, by the Under Secretaries for projects having a TPC under \$400M to \$20M and by the Assistant Secretaries/PAS for projects having a TPC under \$20M to \$5M. This decision authority may not be further delegated.

The AS is based on facts and circumstances existing at the time of development and, once approved, must be followed. The AS may be changed if it makes good business sense to do so. Any changes, however, must be justified and documented. Material changes to the AS, such as changes in contract type, competition, or major milestones, must be approved at the same approval level as the original and properly documented. Once the AS is approved, all remaining Critical Decisions may be delegated consistent with this Manual and the AS.

### **5.3 RISK MANAGEMENT PLAN**

**A comprehensive Risk Management Plan, which documents the risks, analysis, and mitigation strategies shall be developed and submitted for approval as part of Critical Decision-1.** Program or project managers will identify, plan, and conduct comprehensive risk assessments for all projects. These risk assessments and plans are to be tailored. Effective risk management and planning will include the entire IPT to flesh-out uncertainties and develop a risk analysis and management plan that ensures risk reduction and mitigation strategies. The plan will identify the controls and processes used to identify areas of cost, scope, schedule, or technical risk that may occur during project planning and implementation.

### **5.4 SYSTEMS ENGINEERING AND VALUE MANAGEMENT PLANNING**

**All projects shall perform formal System Engineering and Value Management. At a minimum, planning shall be accomplished prior to completing the conceptual design activity, initial VM/VE reviews performed as part of completing the CDR, and value studies as part of Critical Decision-2 deliverables.**

#### **5.4.1 Systems Engineering**

The primary goal of the systems engineering process is to transform mission operational requirements or remediation requirements into system architecture, performance parameters, and design details. Beginning with the definition of a need, the systems engineering process is viewed as a hierarchy that progresses through a baseline and ends with verification that the need is met, including interfaces, fit, and completeness. The application of systems engineering to a project is tailored to the project's needs.

Systems engineering involves numerous iterative processes, such as requirements analysis, alternative studies, and functional analysis and allocation. A PM performs this planning and analysis to develop the sub-functions and their relationships that are necessary and sufficient to accomplish the desired top-level functions. These sub-functions form the key input for the project's WBS. **A product-oriented WBS shall be developed as part of system requirements and alternative selection.** At each level (system, subsystem, and component), sub-functions are identified based on the functions, requirements, and resulting design decisions from the previous level. As the level of detail increases, the sub-functions are allocated to systems, subsystems, and/or components.

For complex activities, a functional hierarchy diagram may be used to depict the breakdown of functions into sub-functions. Also, a functional flow block diagram may be generated to show the logical relationship of functions or sub-functions at the system or subsystem level (see the Practices). The functional flow diagram may be used to document which system, subsystem, or component performs the function and sub-functions.

A Systems Engineering Management Plan may be required. For small, non-complex projects, the system engineering planning may be appropriately covered in support of the CDR and/or PEP documents. Larger, more complex projects should normally have a formal Systems Engineering Management Plan issued and in use during the Definition phase.

### **5.4.2 Value Management Program**

The value management methodology, (also known as value analysis, value engineering, value planning, etc.) should be considered for use in all capital asset acquisition process phases. Value Management (VM) is defined as an organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life cycle cost consistent with required performance, quality, reliability and safety. VM is a technique directed toward analyzing the functions of an item or process to determine "best value," or the best relationship between worth and cost. In other words, "best value" is represented by an item or process that consistently performs the required basic function and has the lowest total life cycle cost.

The VM program is an integral part of the overall project delivery process and is not a separate entity designed to "second-guess" the IPT or design authority.

The Department will utilize a two-tiered approach, as defined in the FAR to implement a viable cost-effective VM program. The two VM approaches, as described in FAR Part 48 are the "mandatory program" and the "incentive" (also known as voluntary) program.

#### ***VM Program Basis***

OMB allows Federal Departments and Agencies to apply VM to achieve the greatest benefit. The minimum requirements for VM application, consistent with the two VM approaches described in FAR Part 48, are:

- A formal, mandatory VM program will be required for all facility construction activities having a TPC greater than \$5M. For maximum benefit, VM should be employed as early as possible in the project development/design process so valid VM recommendations can be implemented without delaying the progress of the project or causing significant rework of completed designs. Employed in an organized effort, VM utilizes a systematic procedure for analyzing requirements and translating these into the most economical means of providing essential functions without impairing essential performance, reliability, quality, maintainability, and safety. This organized effort is commonly referred to as the Value Methodology Standard (SAVE International). The VM Standard is the systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall life cycle cost. All mandatory VM studies, are to be accomplished using VM methodology, prior to Critical Decision-2.
- A VM Incentive Program (as described by the FAR) should be required in all contracts that are awarded on facility construction projects having a TPC greater than \$5M, that are awarded after Critical Decision-2, where the following contract conditions exist:
  - DOE or its agents have dictated the specifications, design, process, etc., that the contractor is to follow
  - The contractor's cost reduction effort is not covered under award fee (or any other incentive)
  - The CO has confidence in the cost estimate for the work at issue. That is, confidence in the cost estimate is close to normal FAR pricing conditions
  - The CO has great confidence in the contractor's accounting system, can separately track costs of VM efforts based upon the contractor's assertions and confirmation from the DOE cognizant CFO. That is, confidence in the contractor accounting system is comparable to normal FAR pricing conditions.
  - The proposal, if accepted, requires a change to the contract and results in overall savings to the DOE after implementation.

Additionally, it is the responsibility of the Department's Under Secretaries and their respective organizations to develop criteria and guidelines that conform to P. L. 104-106, "National Defense Authorization Act for Fiscal Year 1996," and OMB Circular A-131, for both in-house personnel and contractors that identify programs/projects with the most potential to yield savings from the application of VM techniques.

## **5.5 PROJECT ENGINEERING AND DESIGN FUNDS**

Based on the PDS, PED funds are requested annually as “design only” funds for preliminary and final design. PED funds are not to be used for construction, long-lead procurement, or major equipment items. If early funding is required for these items, a preliminary PDS should be submitted prior to Critical Decision-2, with justification for these funds. PED funding requests are developed from historical data or parametric estimates. The objectives for the use of PED funds are to:

- Improve the probability of developing an accurate project APB
- Establish the APB after preliminary design is completed
- Improve the DOE’s planning, programming, and budgeting process for the acquisition of projects
- Provide funds for VM activities (see OMB A-11, Section 5.3.4, and FAR).

Acquisition planning, the acquisition strategy, and Critical Decision processes play important roles in the PED process.

Critical Decision-0 determines if the capital asset is required and the date by which it will be provided. That requirement date, together with the project’s risk assessment, projected construction uncertainties, equipment lead times, funding constraints, and other related issues, will lead DOE in establishing planning, programming, and budgeting for PED and project funds. OMBE input and DOE budget priorities may affect prioritization of a project’s PED and funding profile. Early PED requests should be confirmed and updated as part of the Critical Decision-1 process. Critical Decision-1 determines and describes the concept/alternative that has been selected and provides management approval for the follow-on design phase. APB validation and Critical Decision-2 should receive DOE approval early enough to support the PDS submission to OMB.

### **5.5.1 Project Engineering and Design Funding Requests**

The “Budget Formulation Handbook” establishes PED budget formulation and submission requirements. Requests for PED funds to initiate new design projects throughout all program elements within DOE began with the FY 2002 budget submission. To aid future PED requests, the following guidance is provided:

- PED budget requests include projects that have achieved Critical Decision-0 prior to the PED budget submission to OMB
- PED budget requests include funds necessary to complete project Preliminary and Final Designs (through Critical Decision-3)
- Budget requests subsequent to the FY 2002 request include PED funds to initiate design of new projects and continue or complete project designs previously funded by PED

- The PED funding requested depends on projected funding requirements, length of design period and budget guidance
- The PED PDS prepared by the PAS will identify anticipated projects recommended for PED funding
- PED funds for preliminary and final design will be released by the PAS upon Critical Decision-1 approval
- After release of PED funds, any movement of funds between or among design projects requires prior PAS approval and notification of OMBE. All movement of funds should be reported in subsequent PED requests.

PED funding may be used for new projects not previously identified, if funds are available in the PED fund, and if the PAS approves. Subsequent PED requests should be adjusted to reflect the transfer of funds and the initiation of a new project. The PAS should notify Congress (via OMBE) before initiating preliminary design for a new project (see Section 2.4.3).

Since FY 2002, the PAS have been required to request PED funds to initiate any new design projects. PED funds will be used for projects that have an anticipated FY 2004 or later construction start. No procedural changes are required for projects funded for design and construction prior to FY 2002.

## **5.6 CRITICAL DECISION-1, APPROVE SYSTEM REQUIREMENTS AND ALTERNATIVES**

The prerequisites for Critical Decision-1 include the completion of the Definition stage, which include RD, functional and operational requirements, acquisition planning, and risk comparisons required to define the project scope. This planning stage addresses feasibility and technology identification. In addition, the project team focuses on better defining the technical scope and determining the best solution from business, scope, schedule, cost, and other technical perspectives.

In the Definition stage, a high-level RD is agreed upon with the system owner, users, and project team. For all projects, including software, this becomes the initial building block in developing the APB. Successful completion of the conceptual design effort leads to preparation of a Critical Decision-1 submittal package and approval of Critical Decision-1, Approve System Requirements and Alternatives. Critical Decision-1 reaffirms the MNS for a proposed project and forms the basis for proceeding with preliminary design (project execution). Two important outputs of the conceptual design effort are the CDR and RMP. The CDR documents and supports plans and reports that provide the basis for the decision to move forward and complete the design by beginning the preliminary design activity. Changes to the preliminary rough order estimates and schedules for the project are

documented and controlled through the change control process. **The WBS shall be used to generate an order of range cost and schedule estimate and included in the Critical Decision-1 package.**

## 5.7 PROJECT EXECUTION PLAN

All projects provide both a draft PEP submittal as part of Critical Decision-1 (no other approvals required at this time), and a final PEP that is approved by the appropriate SAE/AE. If appropriate, these plans may be combined. **A PEP shall be prepared for each project; be an accurate reflection of how and by whom the project is to be accomplished; and prepared, submitted, and approved by Critical Decision-2.** The PEP should be developed by the IPT, under the direction of the PM. A PEP summarizes critical information and documentation necessary to manage a project. The PEP uses the results from all project planning processes and combines them into a formally approved document used to manage and control project execution. Because of the importance of this particular document to the success of a project, considerable effort needs to be made to assure that the PEP is thorough and comprehensive. The PEP should: (a) accurately reflect the manner in which the project is to be managed and performed, (b) receive the necessary local reviews and approvals, and (c) be submitted to the SAE/AE in a timely manner, prior to the associated Critical Decision (see Section 2.3.1).

A PEP is developed by the Program and/or the project manager using an integrated, systematic approach that ensures a project management system based on effective management practices that are sufficiently flexible to accommodate the size and complexity of the project. Organizational policies, constraints, and assumptions are also inputs into the development of a PEP. A preliminary PEP should be prepared, approved by the AE, and submitted in support of Critical Decision-1, Approve System Requirements and Alternatives. The completed PEP should be prepared and submitted in support of Critical Decision-2, Approve APB. PEP approval will normally be a precursor to Critical Decision approval.

Specific project activities and actions to be considered in developing and preparing a PEP include:

- Identifying project participants' responsibilities, authorities, and accountabilities
- Organizing and preparing a project WBS and WBS Dictionary
- Interfacing the OBS with the WBS for assignment of responsibility and delegation of authority
- Identifying and sequentially organizing both DOE and contractor project activities and durations
- Performing critical path calculations and establishing project activity durations

- Developing resource-loaded project activities
- Doing risk assessment and mitigation planning
- Developing a preliminary order of range project cost estimate
- Establishing or identifying a progress (performance) measuring and reporting system
- Developing a method of communicating results, reviews, and revisions of project documentation to project participants and stakeholders.

Once the project planning methodology is established, the combined skills and knowledge of project team members and external stakeholders are used to maximum advantage in developing the PEP. The PM builds the team as the team builds the PEP, developing both mutual consensus and a sense of ownership.

A complete description of the expected contents of each PEP topic is provided in the Practice that addresses the PEP. Each PEP may discuss each topic in the sequence presented to assist in the DOE Headquarters review and approval process. Topics not addressed but referenced can be identified in the PEP. Deviations from the identified list can be discussed in the PEP. The minimum elements covered by a PEP should include:

- MNS/project objectives
- Summation of APB and KPPs
- Project description, including reference to operational, technical, and functional requirements
- An AS including funding, site development, permits, and licensing
- Project organizational structure including roles, responsibilities, authorities, and accountabilities; decision authority for DOE Headquarters and Field Elements, Program and project management; support functions such as safety analysis, health physics, ESH&Q; NEPA, etc.
- Resource requirements
- Any long-lead procurement and contracting action requiring integration
- Integrated Safety Management
- Systems/Value Management planning and plans for continuing the activity
- RMP (separate, but updated)
- QAP (generally separate, but updated)
- Research & development, test and evaluation, alternative studies, trade studies
- Design Reviews
- WBS and WBS Dictionary



- Project cost, schedule, and scope order of range estimates (or preliminary range for a preliminary PEP), including separately identified risk allocations, and descriptions of baseline change control thresholds
- Life cycle costs, cost control, and change management
- Project control systems and reporting systems
- Inspection, testing, test evaluation, turnover and startup
- Training.

The PEP may be tailored to meet the needs of a project, based on size, scope, complexity, cost, and schedule. As appropriate, topics may be included in the PEP by reference. When these topics are referenced in the PEP this should be documented in the PEP. The rationale for tailoring can be presented to the SAE/AE.

When prepared, a PEP is to be submitted for DOE Headquarters review and approval using a PEP Approval Form. Following approval, a PEP should be maintained under configuration control.

As a project progresses and more information becomes available, a PEP may, of necessity, require revising. Extensive revisions should be submitted to, reviewed by, and approved by the same entities that reviewed and approved the original document.

An expanded example of the contents of a PEP is provided in the Practices.

## **5.8 REPORTING**

Monthly project progress reporting is to be implemented after mission need approval. While all reporting elements for each project may not be available at this point, reporting what is available should be routine by the end of the Definition phase. Reporting is accomplished in numerous ways, however, the DOE Project Assessment and Reporting System (PARS) is required. OMBE will organize, coordinate, and direct project status reporting (see Section 10.5).

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# 6

## EXECUTION

In the Execution phase, the initial design concepts are further defined and developed into detailed designs that will be used to procure or manufacture components, fabricate sub-systems, or construct systems, plants, perform remediation, or build facilities. At this point, reporting requirements and baselines for project control are established and subsequently maintained. Environmental and safety requirements are satisfied; and the final design configuration is approved and issued for procurement and construction.

During design, the project is subject to peer or independent reviews and the use of systems engineering techniques, including value management, to ensure the project will provide the essential functions at the lowest life cycle cost consistent with performance, reliability, quality, and safety requirements. Safety, environmental, and quality plans and requirements are to be maintained throughout this phase. The PM should not commit to the performance of any Execution phase task without obtaining required Critical Decision approvals and confirming the availability of funds with the appropriate authority.

### 6.1 PROJECT EXECUTION

Execution comprises the longest and most costly phase of a project. It is the phase when controlling, directing, and reporting are most important. Project Execution includes project segments that extend from the completion of conceptual design to turnover for operation. Execution thus extends from Critical Decision-1, Approve System Requirements and Alternatives, to Critical Decision-4, Approve Transition and Turnover, and includes preliminary design, final design, procurement, construction, testing and turnover, and acceptance. Execution is the summation of all previous project activities, and terminates when the project is sufficiently ready to commence turnover, and acceptance of project deliverables by the owner/user.

The process of project Execution requires the PM to coordinate and direct the various physical, contractual, technical, financial, and organizational interfaces that exist during this time. This is particularly important because the Execution phase is the portion of the project that requires the greatest resources, and the time when mistakes can result in the greatest schedule and cost impacts.

The success of the construction and turnover portions of project Execution is dependent upon decisions made during design. Therefore, the PM needs to maintain an awareness of the design philosophy being pursued; design products planned; contracting/purchasing

practices, methods and procedures; environmental, safety, health, and quality requirements; fabrication and construction practices; closeout of construction and procurement contracts; and structures, systems, and equipment checkout, testing, and acceptance. Because of these varied and demanding requirements, the IPT is generally at its greatest number and its greatest diversity during the Execution phase. The Execution phase is also the project phase that requires that a PM (and the IPT) be given significant project authority as well as the support of upper management.

The success of the Execution phase is dependent upon design efforts: pre-acquisition, conceptual, preliminary, and final. No amount of careful project management, construction management, or contracting can guarantee success if the design is flawed, because the products of the design—defining requirements, developing baselines, and developing planning for the remainder of the project—form the basis of all future project activities.

For the above reasons, the construction management plan is heavily dependent upon the design stage of the project. This is the reason the IPT needs to include construction, maintenance, and operations-type personnel (members) throughout the design process. The intent of these “precautions” is that approval of significant design or scope changes after preliminary design is complete may be difficult to implement since hardware is impacted and changes require the review and approval of a CCB.

## 6.2 PRELIMINARY DESIGN

Using the products of the conceptual design, preliminary design initiates the development of a design that is adequate for procurement and construction. This stage of the design is complete when it includes sufficient information to support development of the APB. For a less complex project, preliminary design is often stated as a percentage; generally equivalent to 20 to 35 percent of the total design effort. However, for complex projects preliminary design the percentage of design may not be definitive because complex projects have a high degree concurrency which results in design maturity that may vary by sub-system.

## 6.3 CRITICAL DECISION-2, APPROVE ACQUISITION PERFORMANCE BASELINE

At the end of preliminary design, the APB for the project is established and is an accomplishment that leads to a request for Critical Decision-2. **All projects shall establish an APB at Critical Decision-2, that includes key performance, scope, schedule, and cost parameters to clearly establish the capabilities being acquired; and the schedule and total cost to acquire the capability.** Critical Decision-2 is of paramount importance to the project since it initiates a request for construction funds, which may involve Congress. A request for Critical Decision-2 also exposes the project to external reviews and performance of an ICR or independent cost estimate (ICE), if required by the AE. An external review of

the project serves as a measure of the Department's overall performance-to-date. Documentation prerequisites for Critical Decision-2 are identified in the PEP. A major input for Critical Decision-2 approval includes an independent cost review and an APB external independent review. **An external independent review (EIR) shall be performed by OMBE to validate the APB prior to approval at Critical Decision-2.** A Critical Decision-2 decision is commensurate with the Department's commitment to continue with final design and establish a baseline budget for construction.

For software projects, Critical Decision-2 marks the completion of functional design. This stage describes the logical system flow, data organization, system inputs and outputs, processing rules, and operational characteristics of the software product. If commercial off-the-shelf (COTS) software is selected, it may be purchased upon completion of this stage.

## 6.4 FINAL DESIGN

The remaining design (generally the last half to three-quarters) consists of finalizing the work underway, and producing and releasing construction and procurement documents/packages. As the design is finalized, the PEP, scope of work, cost estimates, and schedules are updated and approved through the change control process. Mission need is again reviewed, particularly with respect to changing conditions that are not within the control of the project, such as overall site priorities, new technologies, changes in cleanup strategy, changes in planned funding, and so forth. If approved, advanced procurement for long-lead items may be initiated prior to completing final design to support the project schedule.

## 6.5 CRITICAL DECISION-3, AUTHORIZATION TO IMPLEMENT

With design essentially complete and all environmental and safety documents approved, the project is ready to begin procurement and construction activities. **All projects shall identify a point of full execution and/or implementation (Critical Decision-3), schedule an EIR for MS, and an IPR for non-MS.** OMBE performs this review for MSs and the PAS performs it for non-MSs. Critical Decision-3 approval supports the expenditure of funds for these activities. The decision to proceed with construction is well documented and reviewed by either an EIR for MS projects, or an IPR for non-MS projects. The type of review depends upon the project's TPC. As with other project decisions, there is no substitute for careful, thorough reviews to support an informed decision. Construction is generally performed with capital funds—funding type, however, is not a driver for Critical Decision-3.

To this point, each Critical Decision has occurred at a discreet time. For particular projects, however, it may be necessary to subdivide Critical Decision-3. For example, a long-lead procurement might constrain construction, and an early or phased Critical Decision-3 could be initiated and justified. Another example is early start of decontamination and decommissioning work for projects that modify existing facilities. In this case, however, the

decision is only applicable for that particular procurement package. While there is potential risk in procuring equipment before the design is complete, the potential schedule improvement may be significant and more than compensate for the risk. The need to phase or segment Critical Decision-3 is not to be confused with minor, early activities that are necessary, and generally performed prior to Critical Decision-3. Activities such as site characterization, limited access, and safety and security issues (i.e., fences, etc.) are often necessary prior to Critical Decision-3, and may be pursued as long as funding approvals are in place. Critical Decision-3 is scheduled to occur late in the design period and is intended as a final check of readiness to proceed. If an early or phased Critical Decision-3 is anticipated, the need for this decision and the process should be detailed in the PEP, and if known when the AS is written, in the AS itself.

As described in Chapter 11, “Project Controlling,” rigorous project change control is imposed to help control technical creep, which in turn controls schedule and cost creep. The requirement to report the project and budget status continues through construction completion, acceptance testing, final acceptance, pre-operational testing, and turnover of the facility (or equipment) to the user.

## **6.6 IMPLEMENTATION/CONSTRUCTION**

With sufficient design complete (generally defined as 60 to 75 percent), and after a final design review, the project is ready for Critical Decision-3, Authorization to Implement. With Critical Decision-3 approved, an approval to expend funds for implementation/construction is obtained. Implementation may include activities such as software programming, or remediation of facilities or sites. Appropriate contracts are awarded, and performance is measured in terms of technical, schedule, and cost scopes and baselines. If fixed-price contracts are involved, progress is generally measured via milestones and progress payments. In all cases, approved and validated project baselines, completed designs, and energetic management control significantly mitigate problems during this stage of DOE projects—especially those unique projects having specialized equipment and processes.

Completion of construction and transition into a RA or an ORR are the final steps in the Execution phase, and lead to IOC and Critical Decision-4 approval.

During the construction stage of the project, the important elements for success include:

- Clearly identified contract, procurement, and construction contractor requirements
- Effective management and control of technical, scope, schedule, and cost baselines, and risk allocations
- Efficient and effective change control
- Oversight and management of subcontractors and vendors

- Well-planned commissioning and acceptance activities
- Translation of software functional design specifications into a set of technical, computer-oriented system design specifications in preparation for programming installation.

## 6.7 PROJECT MANAGEMENT SUPPORT SYSTEMS

Many processes and systems are available for use during a project's life cycle to facilitate the project management process. These processes are particularly important during project Execution as the majority of a project's resources are "consumed" during this phase. A few of the more important processes are identified in the following paragraphs, and the PM should assure these processes are fully functional and operational prior to Critical Decision-2.

- Integrated Safety Management System. Assures that safety is included in all project planning documents, especially construction work packages. Required ISM practices are imposed on all project suppliers, contractors, and subcontractors, as appropriate. Safety audits are implemented, and incidents and accidents are promptly and adequately investigated, reported, and communicated.
- Quality management process. Provides assurance that necessary quality features are included in design documents; audits and appraisals to identify system deficiencies are performed, documented and tracked to closeout; inspections are performed as required and deficiencies noted and corrected; and project deliverables meet performance and project mission requirements.
- Project Controls. Assures that established requirements and baselines are monitored and compared with actual and planned performance. These include:
  - Oversight of project requirements during the preparation and award of contracts that initiate project activities
  - Control of APBs and performance baselines that continues throughout project performance and closeout
  - Identification, control and management of all project interfaces with other projects and non-project activities and entities.
- Resource management process. A structured system that continually evaluates the resources available to the project and compares availability to forecasted project needs. This process continually attempts to identify qualified personnel to assist in project execution.
- Configuration management process. Assures changes to established project baselines are documented, evaluated, and considered at the proper management level for acceptance or rejection. This system also documents all requests for changes, justification for changes, and final decisions concerning changes.

- Cost and schedule estimates are used and updated as required to ensure realistic and accurate performance.
- Change requests. Each project should insist that the individual requesting a change become the “sponsor” of that change and be responsible to complete the change request form identifying technical, scope, schedule, and cost impacts to the project and to any other associated activities. The use of a change-request checklist is encouraged.
- Documentation and data management process. Assures that all essential project documents are prepared, identified, reviewed, approved (as appropriate), reproduced, distributed, filed, and dispositioned at project completion. Also assures that only the latest versions of approved design and construction documents are being used. The documentation process insures the completion of design reviews, prompt response to review comments, and tracking comments to closeout.

In addition, this process can ensure the receipt of specified contractor, subcontractor vendor data, and its review, approval, and acceptance. This process will prove especially valuable during the turnover and project closeout activities, particularly in obtaining as-builts of all structures, systems, and components.



# 7

## TRANSITION/CLOSEOUT

A planned, structured, and organized project transition and closeout is essential to the success of any project. Transition and closeout is the progression of a project from implementation to turnover for operations. The project may begin transition and turnover at the point when it has achieved an initial operating capability (IOC). This turnover may include packaging and disposal of all waste or the transition to long term maintenance and surveillance. IOC for a project is to be defined as part of the APB. At a minimum, the project is to have attained sufficient operational capability to transition to operational control. Attainment of full operational capability (FOC) is normally led or accomplished by the operational organization. Full operational capability, which includes full production and other optimizations, is not normally the project's responsibility. **All projects shall plan and issue a project Transition/Closeout document (normally started in the Definition phase and issued in the PEP) which provides the basis for attaining initial operating capability (IOC) and obtaining Critical Decision-4 approval.**

Planning for transitioning to the operator, end user, or other organization is an integral part of project planning and performance and includes the identification of funds to perform the required activities. Proper planning, preparation, adequate funding, and staffing are essential to transitioning, turnover, and closeout activities. Without proper planning, these activities become time-consuming, costly, and may ultimately prove unsatisfactory.

Although turnover of a completed facility is preferred, the phased nature of projects may require partial turnovers. Partial turnovers are acceptable if cost-effective and beneficial to the DOE. Partial turnovers can include equipment items, operating systems, or facility areas. In any case, a properly planned and implemented project transition and turnover develops ownership within the user organization and serves to transfer ownership from the project to the user. The following activities, some of which precede Critical Decision-4 and some of which follow, are the PM's responsibility as a project progresses from Execution to Closeout. These activities can be tailored based on the needs of the project.

The PM, with the support of the IPT, should establish a turnover, occupancy, and acceptance process that includes punch list item resolution, user walk-downs, verification of requirement compliance, system startup for proper operation, and documented transition from the project and acceptance by the user. An early turnover activity may be to prepare a memorandum of understanding with the user to document the extent of the turnover package. For example, spare parts, manuals, procedures, vendor data, etc., that typically "belong" to neither organization.

## **7.1 CHECKOUT, TESTING, AND COMMISSIONING**

Early physical turnover and transition activities should include facility walk-downs for identification and correction of physical, process, safety, quality, or environmental deficiencies; and planning, preparation, performance, and documentation of equipment and systems testing and operation. Checkout and test planning and preparation typically begin at the equipment (item) level, progress to the system level, and culminate at the facility level. Test planning begins during design to ensure that physical features necessary to support testing are provided.

### **7.1.1 Checkout**

Equipment, systems, and facility checkout/walk-down efforts may be performed by the construction entity in cooperation with the project organization to identify problems and deficiencies. However, the PM/IPT prepares lists of findings (punch lists) and initiates documentation to implement corrective actions. Identified corrective actions are tracked and statused through closeout. Checkouts may not always be actual walk-downs. For example, for IT projects an appropriate check may still be performed even if a walk-down is not. Walk-downs occur when the constructor notifies the project that construction (or portions of construction) is complete. The basis for walk-downs is approved design, safety, quality, and construction documents. Walk-downs are performed by organizing combined project/construction/user teams that review and inspect equipment, systems, or facilities as they are declared complete by the construction contractor, and comparing the “completed product” against approved requirements. The team documents discrepancies and deficiencies using a punch list(s), identifies corrective actions, assigns a responsible individual for each deficiency, and identifies a corrective action completion date. Deficient items are tracked to completion and then re-inspected and (if necessary) retested for acceptability. The walk-down activity should serve as a basis for user acceptance of a completed project. Generally, the constructor is responsible for correcting deficiencies and problems. However, all corrective actions that involve new work scope, if approved, will have to be funded by the project.

An especially important yet generally separate walk-down is a safety walk-down. The safety walk-down should be performed by qualified project/user/safety personnel immediately prior to facility transition. A safety walk-down identifies any facility, system, or equipment safety deficiencies that might still exist. A safety walk-down team is instructed concerning the purpose of the walk-down and is to be totally focused on safety.

### **7.1.2 Testing and Commissioning**

The purpose of testing and commissioning is to assure technical performance. The PM/IPT should prepare (or have prepared) component and system test procedures, perform or

witness tests, document test results, and complete or have completed all required corrective actions. Test and commissioning teams can be structured to possess the capabilities necessary to prepare test plans, perform all test activities, evaluate test results, and identify and initiate corrective actions. The test teams may include project and user personnel. Testing serves to verify that the components, systems, and facilities meet or exceed design requirements and performance parameters, and to train user personnel in the arrangement, location, control, and operation of the completed facility.

Checkout and testing is demanding and rewarding, as the project team realizes success as structures, systems, and components are tested and accepted. Key activities include the preparation and approval of test procedures, and the organization of test teams. Procedures are prepared by personnel who are (or will be) part of the test teams. User organization personnel are also part of the test teams. An important concept of acceptance testing is “Don’t lose momentum!” When testing begins, the PM assures testing continues safely, and to the extent possible, without interruption.

## **7.2 KNOWLEDGE TRANSFER**

The project organization works closely with the user in developing and presenting (or helping present) specific process and facility related training, and continues to provide support to the user operations and maintenance forces throughout transition and turnover. The “driver” for this activity is to transfer project knowledge and experience to the user prior to closeout of the project and reassignment of project personnel. Training may include both classroom and hands-on (performance-based). If possible, project personnel should remain available “as needed” through facility cold operation.

## **7.3 DOCUMENTATION**

Turnover of a completed project to the user should include the turnover of appropriate project documentation/records. Records should be complete, properly identified, approved, and orderly. Records not provided to the customer are prepared for storage or disposal. Records include design, procurement, construction, pre-operational, testing, startup, safety, quality, and as-builts. In certain cases, electronic and hard copies of project records may be provided. As appropriate (and when available), project documentation that supports transition, turnover, ORR, and operation are to be made available to the user organization. All records that are turned over to the user or sent to storage may be accompanied by a complete inventory list. A duplicate of these lists may be maintained by the project organization (see the Practice on Records).

## **7.4 LESSONS LEARNED**

At completion, the project should prepare, distribute, and place into the permanent project records a lessons learned document. This includes any lessons learned from VM activities. If properly planned, a project lessons-learned program is in-place when the project is organized, with frequent distribution of interim lessons learned reports. The final lessons learned report then becomes assembling and issuing interim reports as a single document.

## **7.5 LOGISTICS**

The PM/IPT should perform or assure these activities are performed prior to turnover, project closeout, and personnel reassignment. The following is typical of items to be provided and documents to be made available:

- Operating and maintenance manuals and procedures
- Vendor data files including drawings, manuals, and specifications
- Preventive maintenance procedures and preventive maintenance records for those items of equipment purchased by the project that have required or will require preventive maintenance prior to turnover
- Special tools, lubricants, and spare parts as recommended by vendors, with sufficient inventory provided for one year of operation
- Sufficient spare pre-filters and HEPA filters to accommodate a complete replacement of all such filters prior to hot operation
- Operations and maintenance staff trained and qualified.

## **7.6 READINESS REVIEWS**

The PM and the IPT remain involved, as requested by either the user or DOE, in the RA or ORR process to help make those efforts more time and resource efficient.

Depending upon the type, size, and complexity of the completed systems and facilities, the ORR and approval/acceptance process can be lengthy and costly. Because of this, ORR planning and preparation begins during conceptual design and continues throughout the project life cycle. Planning may involve the PM and the IPT as well as the user/operating organization. Typically, the PM is responsible for assuring the project (facilities, equipment, documentation) is ready for an ORR. The operating organization is responsible for personnel selection, training, qualification, and certification as well as procedures (operating, maintenance, safety) and interfacing with and supporting the DOE ORR Team. The funding required to support ORR activities is usually the responsibility of the project, the operating organization, and the DOE.

The project Transition/Closeout phase is challenging and may be frustrating, but it is also rewarding. The key to a project's success during this effort is detailed and continuous advance planning, good communication, qualified support personnel, and remaining fully committed and involved. Assigning scope, authority, and responsibility to test teams is also a key to success.

## **7.7 CRITICAL DECISION-4, APPROVE TRANSITION AND TURNOVER**

When construction, testing, and turnover are complete and the IOC has been attained, the project is ready to progress to Critical Decision-4, Approve Transition and Turnover. A key part of obtaining Critical Decision-4 is the delivery of appropriate project-related documentation to support the initiation of operations.

For IT, the prerequisites for Critical Decision-4 include completion of programming/configuration, software integration and testing, and product installation and acceptance. In the programming stage, the system design is transformed into the first complete representation of the software. The source code, including suitable comments, is generated using the approved program specifications. The installation and acceptance stage involves all activities required to install the software, database, and data of the software product onto the hardware platform. Rigorous testing is performed to ensure software meets the defined requirements and is capable of running in a production environment.

### **7.7.1 Prerequisites for Critical Decision-4**

- Verify performance criteria met as defined for IOC
- Issue a Final Safety Analysis Report or appropriate safety documentation
- Prepare operating and maintenance procedures
- Complete acceptance testing and correct deficiencies
- Complete a RA or ORR
- Provide a trained and qualified operations and maintenance staff
- Complete and issue a project transition-to-operations report
- If necessary, prepare and issue a project closeout plan that includes management agreement for final fiscal cost and administration closure.

### **7.7.2 Post Critical Decision-4 Activities**

- Demobilize the project
- For software, a migration to production is approved and complete
- Operational documentation

- Complete as-builts
- Prepare and issue a lessons learned report
- Prepared and issue a project completion report.

## **7.8 PROJECT CLOSEOUT**

Termination of a project involves bringing the project to a planned and orderly conclusion, and is to be planned with as much care and attention as other project phases. Termination and closeout need to be controlled to avoid an occurrence where project personnel either leave or are reassigned prior to final project closeout, leaving others to “clean up.”

The primary issues that arise during completion are procedural and emotional. The PM/IPT may strive to effectively resolve both as part of the closeout effort.

### **7.8.1 Demobilization**

Demobilization is a significant event for the PM and project personnel. Emotional issues involve project team breakup and loss of identity, a need for fewer personnel during project completion, pressure from functional organizations to return personnel, and project personnel concerns about their next assignment. To smooth the demobilization process, the PM may (on a tailored basis) consider the following actions:

- Prepare and issue a closeout plan including an evaluation of existing resource requirements
- Meet with the project team to provide information, finalize remaining tasks and provide support to remaining team members
- Determine assignments to complete final project documentation such as a summary status report, budget report, final costs report, and executive summary
- Prepare and provide briefing (as requested) for the DOE, user, stakeholders, and media
- Work with functional peers and team members to establish clear phase-out procedures in terms of each individual’s responsibilities, availability, and future assignment
- Meet with human resources, functional managers, and line managers to identify personnel needs; assist team members in scheduling interviews; and participate in matching needs, capabilities, and availability
- Acknowledge and recognize the contributions of all project participants.

### **7.8.2 Administrative and Financial Closeout**

After either achieving its objectives or being terminated for other reasons, a project requires closeout. Administrative and financial closeout verifies and documents project results to formalize acceptance of a product or project by a sponsor, client, or user. It includes project

records, analysis of project success and effectiveness, and archiving such information for future use.

Administrative and financial closeout activities are not delayed until project completion. Each phase of the project should be properly closed to ensure that important and useful information is not destroyed or lost—contracts are closed in a timely fashion and plans are laid for final closeout, prior to the loss of key project institutional knowledge.

All documents that record and analyze project performance, including planning documents that establish the framework for performance measurement, are to be available for review during administrative closeout. This includes appropriate project records that aid understanding project initiation, performance, technical, schedule, and cost scopes.

Documents that describe the project deliverables (plans, specifications, technical reports/studies, drawings, electronic files, etc.) may also be available for review.

A set of indexed project records is prepared by the project for archiving. Any project-specific or program-wide historical databases pertinent to the project are updated. When projects are performed under contract, or when they involve significant procurement activity, particular attention may be given to archiving financial records.

Documentation stating that a client/sponsor/user accepts the product of a project is to be prepared, signed, distributed, and filed.

### **7.8.3 Closeout**

Closeout involves procedural issues and phase-out administrative procedures, transfer of responsibilities, financial closeout activities, and preparation of appropriate documentation. The purpose of a project closeout effort is to assure a timely, orderly, cost-effective project termination. If the closeout is complex, and may take substantial time, a closeout plan should be issued prior to full project demobilization. To ensure orderly closeout of a project, the project should, at the direction of DOE—once all costs are incurred against the project with invoices and contracts are closed—prepare a project closeout report following the approval of Critical Decision-4, Approve Transition and Turnover. The following items should be addressed in the closeout report (see the Practices):

- Technical, scope, cost, and schedule baseline accomplishments
- Financial closeout, including a final cost report with details as required (including claims and claims settlement strategy where appropriate)
- Deactivation, decontamination and decommissioning planning (if required)
- Closeout approvals
- Permits, licenses, and/or environmental documentation

- Contract closeout status
- Adjustments to obligations and costs
- Photographic documentation
- Baseline change control log.



# 8

## ACQUISITION PERFORMANCE BASELINE

The APB is an essential element in the acquisition process. The APB is the Department's means of obtaining corporate performance commitments and approval for a project from the entire acquisition organization, OMBE, and Congress. The APB identifies the performance, scope, schedule, and cost requirements (TPC) for a project. All acquisition projects will establish an APB that is approved by the AE as a part of Critical Decision-2.

The APB is defined by objectives and minimum threshold values that are converted into key parameters. The objectives values are established for performance, scope, schedule, and cost, and represent the desired mission objectives. The threshold values are more conservative objectives for performance, scope, schedule, and cost that represent the APB boundaries, and form the essence of the commitment to Congress. These key parameters define the necessary elements of an APB in terms of performance, scope, schedule, and cost. Key parameters are those that, if the thresholds cannot be met, the AE would require a reevaluation of the concepts, design approaches, and acquisition strategy for an acquisition. The APB key parameters should represent the project as it is expected to be completed. The total number of key parameters should be the minimum number needed to characterize the three major acquisition drivers: performance, scope, schedule, and cost. These parameters, once defined and approved, become the KPPs. A project's APB should include sufficient key performance, scope, schedule, and cost parameters to clearly establish the capabilities being acquired, the schedule for the acquisition, and the total cost to acquire that capability. Figure 8-1 depicts these relationships.

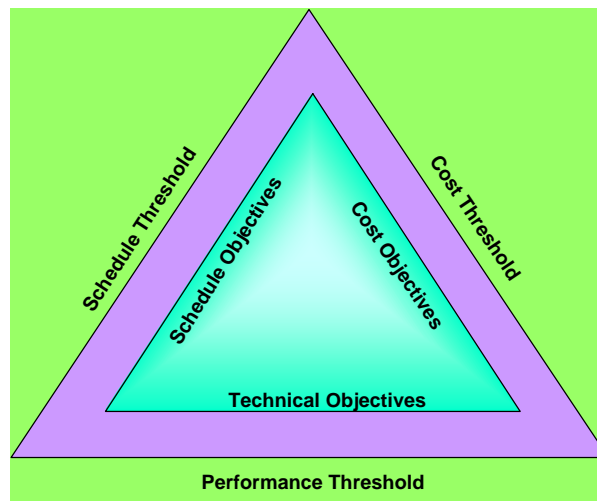


Figure 8-1. The APB Elements

The distinction between KPPs and other technical and scope parameters is that KPPs are objectives, or what the system is expected to do, and define what capability will exist at the end of the project. KPPs represent the operational capability required to perform a specific mission and are therefore stated in terms of performing a function instead of a design parameter or specification. Each project establishes an APB to include the minimum and maximum acceptable performance, scope, cost, and schedule for the required capability. The desired transition to operations is to be defined in the APB as the IOC. The attainment of IOC is one of the key deliverables for completing Critical Decision-4 and ensures that projects can proceed to closeout efficiently.

The project, in coordination with the IPT, can trade off performance, scope, schedule, and cost within the range between the objective values and the threshold values without obtaining approval of the AE. However, the project is to comply with the change control process as defined in the project PEP.

## **8.1 ACQUISITION PERFORMANCE BASELINE CONTENT**

All projects are defined by three primary elements: the performance capabilities necessary to meet a mission need, a timeframe within which the capability is required, and the total cost for providing the capability. These elements are integrated to create the framework within which project execution takes place. The parameters that represent the elements of the APB evolve and develop over time, and are formally established when the APB is approved at Critical Decision-2. The inputs to the process to define the APB include the MNS, functions, operating requirements, constraints, and other external factors as well as the conceptual design output. The parameters include both the objective for what a system is expected to do and the threshold, which is the minimum acceptable for the system.

### **8.1.1 Key Performance Parameters**

A KPP is a vital characteristic of the project or facility mission. A KPP is a characteristic, function, requirement, or design basis that, if changed, would have a major impact on the system or facility performance, scope, schedule, cost and/or risk; or, the ability of an interfacing project to meet its mission requirements. A requirement identified as a KPP may be a performance, design, or interface requirement. A KPP could be applicable either to the overall system/facility level as a whole, and/or to one or more major subsystems.

Parameters that are appropriate for KPPs are those that express performance in terms of accuracy, capacity, throughput, quantity, processing rates, purity, or others that define how well a system, facility, or other project will perform.

Examples include:

- The Pit Disassembly and Conversion Facility shall be capable of processing 35 metric tons of plutonium metal over 10 years of operation.
- The high-level waste vitrification system shall be capable of 100 kg per hour of qualified chemical makeup; containing 40 weight percent high-level waste running on average 2/3 of the time.
- The Tritium Extraction Facility shall be capable of extracting and processing tritium-containing gases from irradiated Tritium-producing burnable absorber rods from a Commercial Light Water Reactor and delivering from 2.5 to 3 kg of tritium per year.
- The Research Office Building shall be capable of housing 300 scientists, engineers, and other support personnel.
- The Business Projection System will provide the capability to handle 1000 users at all times, have a response time of no longer than 7 seconds, and be online 99.9% of the time. However, redundancy need only be available 85% of the time.

The project parameters will evolve as the project definition matures. At the start of the project, during the early planning, definition, and risk reduction stages, performance and scope parameters are usually only measures of effectiveness or measures of performance for a needed capability. More specific project parameters are developed as the requirements become better defined. The majority of the parameters will be defined during concept exploration and design phases. KPPs should be identified which reflect the minimum and/or maximum acceptable performance for the system at completion. The total number of performance parameters can be limited (generally to five or six), and may include parameters that drive effectiveness, schedule, and cost.

### **8.1.2 Schedule Parameters**

Schedule parameters include decision points, major milestones, initial operation, and other critical system events. The mandatory schedule parameters should include all phases of the project, major decision points, deliverables, and initial operation. A project may propose other major events, and they will be included in the APB following approval by the AE. If the threshold values are not otherwise specified, the threshold value for schedule should be the objective value plus six months for MS projects and three months for non-MS projects.

Schedule parameters are established through an interactive process that proceeds integrally with the technical and cost processes. Critical path activities, events, milestones, and resources are developed using a disciplined approach and properly integrated with all other appropriate elements. Schedules are to reflect realistic, risk-adjusted durations, and milestone events that mitigate risks identified during risk analysis.

### 8.1.3 Cost Parameters

The cost parameters contained in the APB should identify the TPC and, in general, include direct costs such as research, development, test, construction, remediation, procurement, fabrication, services and items (equipment, design, etc.), transition and startup operations. Cost of quality, environmental, safety, and occupational health activities, as well as the costs of acquisition items procured with operations and maintenance funds, may be included. Indirect costs not directly attributable to the project but resulting from the project, including any infrastructure costs, are to be included. For reporting purposes, the cost estimate uses life cycle costs and present cost figures in escalated (year of expenditure) dollars. These costs are identified as either TEC or Other Project Costs (OPC). Operationally funded projects may or may not segregate their costs appropriately in these categories, depending upon program guidance. Escalation rates should be documented, and should be those published. Escalation rates used are documented as part of the APB approval process at Critical Decision-2. Multiple KCPs may be developed. **At a minimum Key Performance Parameters shall be established for TPC and Total Estimated Cost (TEC). The TPC is a maximum parameter that cannot be exceeded without being classified as a breach and presented to the AE for a decision.**

The cost parameters are limited to the TPC, TEC, and OPC in budget year dollars, and as with the other APB elements, are documented in the PDS. The APB and TEC should only include costs that are part of the project as approved by the AE.

The threshold values for the TPC are a maximum parameter and are not to be exceeded.

Cost estimates should reflect realistic and risk adjusted estimates of the TPC, including a careful and thorough assessment of risk. Budgeted amounts should not exceed the total cost objectives in the APB.

### 8.1.4 Scope Parameters

While the performance parameters define the required capability qualitatively in terms of how it will perform, the scope parameters define the capability quantitatively in terms of what the end product will be. The scope parameter will reflect the definition of the project that is generated in the conceptual and preliminary designs. The scope will be stated in quantity, size and other parameters that give shape and form to the project.

## 8.2 ACQUISITION PERFORMANCE BASELINE PREPARATION

The approach taken is dependent on the project. When a project is not complex and requires little development, the key parameters may not require significant evolution. The essential requirement is to establish an APB that is fully achievable. Establishing the APB too early can be not advisable. However, if an APB is required sooner, it is done only after careful

consideration of the risks. From a historical perspective, establishing an APB earlier has been a key contributor to projects that breach the baseline.

The development and documentation of the APB, which represents the required capability, evolves as the mission need and requirements analysis processes evolve. The preliminary parameters may only be able to define the objective or even the threshold. The APB continues to mature during conceptual design until all issues preventing definition of the APB are resolved and the key parameters necessary for an APB have been determined.

The application of adjustments to the cost estimate for risk mitigation should be considered in all APB development as being both prudent and necessary. **The APB shall be risk assessed and adjusted for both durations and costs providing a realistic, achievable APB commitment.** Allowances are derived through an analysis of the work scope being scheduled and estimated. This analysis includes technical, scope, schedule, and cost risks as they apply to the Program/project efforts, and is used to account for the uncertainties existing in each component. The magnitude of estimated allowances (schedule, cost, etc.) depend upon the stage of planning and definition, design, procurement, and construction; and the complexities and uncertainties of the operation or component parts of the project or Program. Allowances are a balance between the need to timely establish the APB and the fact that uncertainties can never be completely eliminated until the project is complete. At Critical Decision-2, the APB should be established with a high confidence level. When this is done through a probabilistic approach, using Monte Carlo simulation, it is normally established at a 80 to 85% confidence level. However if the allowances are excessive it is an indication that the APB is not yet sufficiently mature.

No mandatory confidence levels have been established. Probabilistic analysis yields information that is used, along with other information, to make decisions regarding the acceptance of risk. The output of such analysis is highly dependent on the variables chosen for the input to the simulation which have a direct impact on the uncertainty component of the output.

A short list of recommendations concerning the process for determining and applying risk-adjustments include:

- Ranges are estimated at an activity level or at a summary level. Preferably, ranges are estimated as close to the activity level as possible
- Allowances consider the varying degrees of risk associated with various activities
- Allowances are not used to avoid the effort required to prepare a properly detailed and documented cost estimate
- Schedule and cost allowances may be developed for each project task, with the amount of allowance assigned to the various activities reflecting the importance, cost, and

difficulty of the task. These individual allowances are used in developing the project schedule and build the cost estimate.

- A process allowance (or margin) is to be developed and included in project design, especially those having process systems, equipment, valves, lines, and vessels. (This allowance accommodates margins of error in process equipment sizing, and a prudent amount of “surge” in the process systems.)

Once the risk assessments for technical, scope, schedule, and cost have been completed and allowances calculated, these are included in the TPC estimate. These allowances are a key item in supporting the APB at Critical Decision-2.

The APB is documented in the PDSs. The APB parameters contained in the PDS should not be changed unless there is a deviation or administrative breach, both of which require approval of the SAE to re-baseline the project. The PDS is part of the Critical Decision-2 package.

The project record in the PARS is to be created, and when necessary, updated with the most recent APB information. Once the record has been updated, no further changes to the APB values are permitted unless SAE approval is obtained.

In establishing the APB, project completion should be clearly and unambiguously defined. A primary consideration is whether project completion is defined as system or facility turnover to the user, or whether subsequent costs (operating and decontamination and decommissioning) are included in the overall performance baseline (life cycle approach). The APB should include a milestone dictionary that clearly and unambiguously defines all milestones, including project completion.

The APB captures all project costs (TPC includes both capital and operating components) even if the project is fully funded by operating appropriations. Thus:

- $TPC = TEC + OPC$  (including all allowances).
- TEC is Total Estimated Cost which represents system, facility design, procurement and construction costs and allowances, regardless of the source or type of funds. The TEC normally consists of the following: cost of land and land rights, engineering, design and inspection costs, direct and indirect construction costs, and initial equipment necessary for the project to be placed in operation.

OPC is Other Project Costs related to research, engineering, development, startup, and operations. These activities/costs and allowances are essential for project execution and must be included in the TPC.

The following format shown in Figure 8-2 should be used as a cover sheet for the APB package.

<b>ACQUISITION PERFORMANCE BASELINE AGREEMENT</b>	
<b>_____ PROJECT</b>	
<p>With the objective of enhancing project stability and controlling costs, we, the undersigned, submit this baseline document for approval. Our intent is that the project be managed within the performance, scope, schedule, and financial constraints identified. We agree to support the full required funding in the budget submission.</p>	
<b>[SIGNED]</b> _____	<b>DATE</b> _____
Project Manager	
<b>[SIGNED]</b> _____	<b>DATE</b> _____
Assistant Secretary	
<b>[SIGNED]</b> _____	<b>DATE</b> _____
Deputy Secretary of Energy	
cc: OMBE	

Figure 8-2. APB Agreement Form

An example of an APB can be found in the Practice on APB Development and Validation.

### 8.3 ACQUISITION PERFORMANCE BASELINE BREACH

A breach occurs when the PM has reason to believe that the current performance, scope, schedule, or cost parameters cannot be met. When a breach occurs, the PM is to directly and immediately notify the SAE and the AE by memorandum with a copy to the Operations or Area Office Manager, PAS, Under Secretaries, and OMBE.

Within 30 days of the occurrence of the project deviation, the PM should notify the AE of the reason for the project deviation and the actions that need to be taken to bring the project back within the baseline parameters (if this information was not included in the original notification). Within 90 days of the occurrence of a project deviation, one of the following should have occurred:

- The project is to be back within APB parameters

- A new APB (changing only those parameters that breached and/or are unexecutable) will have been approved by the SAE
- An SAE-level project review will have been conducted with a recommendation on a course of action.

In conducting the review, the SAE will determine whether there is a continuing need for a project that is behind schedule, over budget, or cannot reach its minimum performance or scope threshold. The program will recommend to the SAE suitable actions to be taken, including termination, with respect to such project. Any deviation that results in a breach, that is a result of legislative or executive action, such as an appropriation act that modifies the funding or otherwise makes a constructive change in the project, should be deemed an administrative breach. All such changes should be documented and administratively approved by the appropriate SAE within 90 days of the time of the event precipitating the action. Subsequent to the action, any approved change in the APB will be updated in PARS, and during the next budget cycle, in the PDS. Administrative deviations will not be statistically recorded as deviations; however, parameter changes should be reflected in updates. The immediate notification report summarizes and provides limited analysis of the issue(s) in a one-page format, as depicted in Figure 8-3.

<p style="text-align: center;"><b>PROJECT IMMEDIATE NOTIFICATION REPORT FORMAT</b></p> <p>Memorandum for Deputy Secretary of Energy  FROM: DOE Project Manager  SUBJECT: Project _____ Immediate Notification Report</p> <p>The _____ Project has deviated from its currently approved APB, dated _____.  This deviation is described as follows:</p> <p><b>Analysis:</b> The IPT and I will provide you with a proposed change to the current APB. We request your review and action on the proposed APB as attached.</p> <p>cc: OMBE  OECM  Program Support Project Offices  Under Secretary and/or NNSA Administrator</p>
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**Figure 8-3. Project Immediate Notification Report**



# 9

## RISK MANAGEMENT

The DOE's risk management is integrated, forward-looking, structured, informative, and continuous. The key to successful risk management is in early planning, unbiased assessments, and aggressive execution. Good planning enables an organized, comprehensive, and iterative approach for identifying and assessing the risk and handling options necessary to successfully carry out the acquisition of a capital asset. To support these efforts, the six-step risk process (Figure 9-1) should be performed as early as possible in the life cycle to ensure that critical technical, scope, schedule, and cost risks are identified and/or addressed as part of the program and project planning, execution, and budget activities.

PMs should continuously update acquisition and risk assessments and modify their management strategies accordingly. Early information provides data that helps when preparing a MNS, AS, and RMP as well as assisting in contracting and execution. As a project progresses, new information improves insight into risk areas, thereby allowing the development of effective handling strategies. The net result promotes executable projects.

Effective risk management requires involvement of the entire IPT and may also require support from external experts knowledgeable in essential risk areas (e.g., technology, design, safety, quality, manufacturing, logistics, schedule, and cost). External experts may include representatives from users, laboratories, contracting, test, program and industry. Users, including all essential participants are to be part of the assessment process so that an acceptable balance among performance, scope, schedule, cost, and risk can be reached. A close relationship between the Government and industry, and later with the selected contractor(s), promotes an understanding of project risks and assists in developing and executing risk management efforts.

Successful risk management programs should have the following characteristics:

- Feasible, stable, and well-understood user requirements
- A close relationship with user, industry, and other appropriate participants
- A planned and structured risk management process, integral to the acquisition process
- An acquisition strategy consistent with risk level and risk-handling strategies
- Continual reassessment of project and associated risks
- A defined set of success criteria for all performance, scope, schedule, and cost elements, e.g., APB thresholds

- Metrics to monitor effectiveness of risk-handling strategies (Chapter 10)
- Effective test, checkout, and Startup/Turnover plans
- Formal documentation.

To ensure that a risk management program possesses the above characteristics, PMs should follow the guidelines below:

- Assess project risks, using a structured process, and develop strategies to manage risks throughout each acquisition phase
- Identify early and intensively manage design parameters that critically affect cost, capability, or readiness
- Use technology demonstrations/modeling/simulation and aggressive prototyping to reduce risks
- Use test and evaluation as a means of quantifying the results of the risk-handling process
- Include industry and user participation in risk management
- Use developmental test and evaluation when appropriate
- Establish a series of “risk assessment reviews” to evaluate the effectiveness of risk handling against clearly defined success criteria
- Establish the means and format to communicate risk information and to train participants in risk management
- Prepare an assessment training package for members of the IPT and others, as needed
- Acquire approval of accepted risks at the appropriate decision level
- In general, management of software risk is the same as management of other types of risk and techniques that apply to hardware projects are equally applicable to software intensive projects.

## 9.1 PROCESS

Risk management follows a six-step process of risk awareness, identification, quantification, handling, impact determination, and reporting and tracking (Figure 9-1).

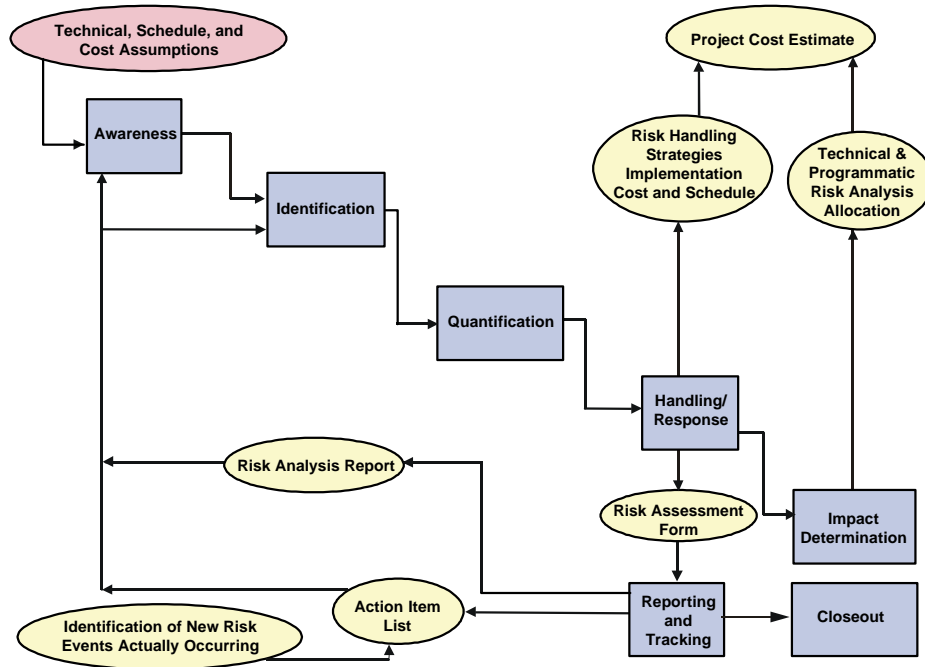


Figure 9-1. Risk Management Functional Flow Diagram

Risk management activities (subsequent to those at project pre-acquisition planning) are the responsibility of individuals identified in the RMP. These responsibilities do not change unless the RMP is revised.

The overriding objective of the risk management process is to identify probable project risks and implement actions that will mitigate the impact of the identified risks. Early risk and hazards identification and analyses should be “built-in” to the project during conceptual design to establish a foundation for further project development, refinement, and execution.

Although each risk management strategy depends upon the nature of the system being developed, research reveals that good strategies contain the same basic processes and structure shown in Figure 9-1. The application of these processes varies with acquisition phases and the degree of system or project definition; all may be integrated into the overall acquisition management function. The elements of the structure and its implementation are discussed in detail in the Practice on Risk Management.

**Risk** is a measure of the potential inability to achieve overall project objectives within defined scope, cost, schedule, and technical constraints. The two components of risk include the *probability/likelihood* of failing to achieve a particular outcome, and the *consequences/impacts* of failing to achieve that outcome.

*Risk events* are elements of an acquisition effort that are assessed to determine the level of risk, such as things that could go wrong for a project or system. The events should be defined to a level that an individual comprehends any potential impacts and causes. For example, a potential risk event for a turbine engine could be turbine blade vibration. There are series of events that contain risk. These events can be selected, examined, and assessed by subject-matter experts.

The relationship between the two components of risk-probability and consequence/impact is complex. To avoid obscuring the results of an assessment, the risk associated with an event should be characterized in terms of its two components: probability and consequences. As part of the assessment, there is a need for documentation containing the supporting data and assessments.

### **9.1.1 Risk Awareness**

The PM should develop a RMP. This plan identifies the scope of the project's risk definition and defines interfaces with other entities, projects, facilities, and organizations; delineates the methodology that will be used to identify and quantify or assess risks; assigns personnel and/or organizational responsibilities; and provides risk tracking and closeout mechanisms. For smaller projects, the RMP may be included in the PEP. The RMP is maintained throughout the life of a project.

These assessments may be performed prior to each Critical Decision, documented, and the results included in the Critical Decision approval request package. Based upon the results of these assessments, the IPT can then develop and implement risk reduction and mitigation strategies. The assessment results can also be used to develop and implement risk-based acquisition strategies and are fully integrated with the overall RMP.

In developing acquisition risk assessments, the PM and the IPT should consider the following categories (as a minimum):

- Project and scope definition
- Environment, safety, and health
- Acquisition and contract management
- Project management
- Funding and budget management
- Technology and engineering management, including project required research or technology development
- Schedule development
- Cost estimate development

- Project interfaces and integration requirements
- Safeguards and security issues and requirements
- Policy and stakeholder issues
- Project location and site conditions
- Legal and regulatory issues.

### **9.1.2 Risk Identification**

Risk identification is initiated through risk screening. Screening is performed against an established set of trigger questions, identifies significant potential risks associated with a project, and focuses on the ability to design and execute the proposed project and to operate the resultant facility or property.

The process identifies “potential” project risks (e.g., cost, scope, schedule, and technology), by preparing clear-risk statements with corresponding bases flagged in the risk-screening step. When defining risks, the level of detail is commensurate with the stage of the project. For example, during project pre-acquisition planning, new technology is being considered. In describing this risk, it can have applicability not only to the technology area but also to the potential resources, design complexities, testing, and interfaces among systems and components within the project scope and with external entities or procurements.

The degrees to which these details are applicable to the project are unknown at the pre-acquisition planning stage. However, for risk purposes, they can be “expected” and considered in risk evaluation and be identified as potential cost and schedule impacts even if there is only one risk identified. This is sufficient, since an early objective of risk analysis is to establish sufficiently accurate scope, schedule, and cost bases to ensure that the project can be successfully implemented.

In the risk identification process, the difference between an initial risk assessment and subsequent risk assessments is the level of detail expected as a project matures. As more information becomes available, previously identified risks are divided into discrete risks to better facilitate handling, tracking and resolution of both risks and associated action items.

### **9.1.3 Risk Quantification**

Risk quantification follows the process documented in the RMP. Using one of the methods described in the Practice on Risk Management, quantification is based on a combination of risk probability and consequence. If the initial process is revised, the new process is reflected in the revised RMP. Figure 9-2 provides a sample risk quantification matrix.

		Risk Level				
Probability of Risk Materializing	Very Likely	Low	Moderate	High	High	High
	Likely	Low	Moderate	High	High	High
	Unlikely	Low	Low	Moderate	Moderate	High
	Very Unlikely	Low	Low	Low	Low	High
		Negligible	Marginal	Significant	Critical	Crisis
Severity of Consequence						

Figure 9-2. Typical Risk Level Matrix

### 9.1.4 Risk Handling/Response

For each identified risk, the risk-handling strategy is reviewed to ensure that necessary action items are being developed and implemented. For each new risk identified, a risk-handling strategy is developed.

Several tools exist to mitigate risks, including the following:

- **Cost.** Involves risk adjusted estimates/baselines, VM, and constant cost reduction/cost control activities.
- **Schedule.** Involves risk adjusted schedules/activities, long-lead procurements, workarounds, make/buy decisions, and early initiation of some activities.
- **Technical.** Involves technology development plans, laboratory tests, VM, and demonstrations, bench scale tests, and pilot-plant tests.

### 9.1.5 Risk Impact Determination

Each identified project risk has potential impact(s) on the project. Impacts should be documented. The potential for project impacts can be minimized by:

- Incorporating handling strategies intended to minimize the impact of an identified risk into the project baseline, and adjustment of the proposed baseline range estimate (technical, schedule, cost) to reflect this incorporation
- Develop cost estimates for the mitigation strategies.
- Incorporating schedule float into the integrated project schedule to reflect anticipated delays associated with potential risks.

Where appropriate, a formal gap analysis should be completed to evaluate the risk between project requirements and proven technologies.

### **9.1.6 Risk Reporting, Tracking, and Closeout**

Risk reporting involves documenting risk identification, risk quantification, risk handling strategies, impact determination, and risk closeout.

Risk tracking involves monitoring action items from risk-handling strategies/responses, identifying a need to evaluate new risks, and reevaluating changes to previous risks.

When a project performs an acquisition risk assessment the findings/results need to be included in the Critical Decision request-for-approval package. When preparing this package, the PM may include a discussion of each of the topics identified in the Practice. Based upon the project complexity and other factors, the results of the risk assessments performed by the project may be specifically selected for review by OMBE (OECEM and Program Analysis & Evaluation). This review, if performed, would be done in support of the other required reviews that are associated with the various critical decisions.

Risk closeout is assigning risk associated action items to a responsible individual and identifying a completion date. Completion dates are tracked and each action item status updated until closeout. The action item tracking system is commensurate with the size and complexity of the project. This process follows the system prescribed in the RMP. If deviations prove necessary, they are shown in a revision to that plan.

Detailed guidelines for risk-handling strategies are provided in the Practice on Risk.

## **9.2 RISK DISCUSSION**

Implicit in the definition of risk is the concept that risks are future events, i.e., potential problems, and that there is uncertainty associated with the project if these risk events occur. Therefore, there is a need to determine, as much as possible, the probability of a risk event occurring and to estimate the consequence/impact if it occurs. The combination of these two factors determines the level of risk. For example, an event with a low probability of occurring, yet with severe consequences/impacts, may be a candidate for handling. Conversely, an event with a high probability of occurring, but with consequences/impacts which do not directly affect a project may be acceptable and require no handling.

To reduce uncertainty and apply the definition of risk to acquisition programs, PMs should be familiar with the types of acquisition and project risks, understand risk terminology, and know how to measure risk. These topics are addressed in the next several sections.

### **9.2.1 Characteristics of Acquisition Risk**

Acquisition projects tend to have numerous, often interrelated, risks. They are not always obvious; relationships may be obscure; and they may exist at all project levels throughout the life of a project. Risks are everywhere; in the early planning; in support provided by

other Government agencies; in mission need risk assessment; and in prime contractor processes, engineering and manufacturing processes, and technology. The interrelationship among risk events may cause an increase in one because of the occurrence of another. For example, a slip in schedule for an early test event may adversely impact subsequent tests, assuming a fixed period of test time is available.

Another important risk characteristic is the time period before a future risk event occurs; because time is critical in determining risk-handling options. If an event is imminent, the PM may have to resort to crisis management. An event that is far enough in the future to allow management actions may be controllable. The goal is to avoid the need to revert to crisis management and problem solving by managing risk up front.

An event's probability of occurrence and consequences/impacts may change as the development process proceeds and information becomes available. Therefore, throughout the development phase, PMs should reevaluate known risks on a periodic basis and examine the project for new risks.

### **9.2.2 Acquisition Program or Project Processes, Risk Areas, and Risk Events**

Acquisition risk includes all risk events and their relationships to each other. It is a top-level assessment of impact to the project when all risk events at the lower levels of the project are considered. Acquisition risk may be a roll-up of all low-level events; however, most likely, it is a subjective evaluation of the known risks by the PM, based on the judgment and experience of experts. Any roll-up of project risks should be carefully done to prevent key risk issues from "slipping through the cracks." Identifying risk is essential because it forces the PM to consider relationships among all risks and may identify potential areas of concern that would have otherwise been overlooked. One of the greatest strengths of a formal, continuous risk management process is the proactive quest to identify risk events for handling and the reduction of uncertainty that results from handling actions.

A project has continuous demands on its time and resources. It is, at best, difficult and probably impossible to assess every potential area and process. To manage risk, PMs should focus on the critical areas that could affect the outcome of their projects. WBS product and process elements and systems engineering and manufacturing processes should capture most of the significant risk events. Risk events are determined by examining each WBS element and process in terms of sources or areas of risk. Broadly speaking, these sources generally can be grouped as scope, cost, schedule, and performance, with the latter including technical risk. Following are some typical WBS risk areas:

- Requirements Definition. The sensitivity of the project to uncertainty in the system description and requirements except for those caused by threat uncertainty.



- Environment, Safety and Health. The controls, sensitivities, and impacts that the project has or will have to be dealt with to be effective.
- Design. The ability of the system configuration to achieve the project's engineering objectives based on the available technology, design tools, design maturity, etc.
- Test and Evaluation. The adequacy and capability of the test project to assess attainment of significant performance specifications and determine whether the systems are operationally effective and suitable.
- Modeling and Simulation. The adequacy and capability of these tools to support all phases of a project using verified, valid, and accredited modeling and simulation tools.
- Technology. The degree to which the technology proposed for the project has been demonstrated as capable of meeting project objectives.
- Logistics. The ability of the system configuration to achieve the project's logistics objectives based on system design, maintenance concept, support system design, and availability of support resources.
- Safeguards and Security. The sensitivity of the project to the uncertainty that may result from safeguards and security requirements.
- Production. The ability of the system configuration to achieve the production objectives based on the system design, manufacturing processes chosen, and availability of manufacturing resources such as facilities and personnel.
- Concurrency. The sensitivity of the project to uncertainty resulting from combining or overlapping life cycle phases or activities.
- Capability of Developer/Contractor. The ability of the developer/contractor to design, develop, and build the system. The contractor should have the experience, resources, and knowledge to produce the system.
- Cost/Funding. The ability of the system to achieve the project's life cycle cost objectives. This includes the effects of budget and affordability decisions and the effects of inherent errors in the cost estimating technique(s) used (given that the technical requirements were properly defined).
- Management Interface/Integration. The degree to which program/project plans and strategies exist and are realistic and consistent. The IPT should be qualified and sufficiently staffed to manage the project.
- Funding and Budget Management. The sensitivity that the project has to funding and budget changes.
- Schedule. The adequacy of the time allocated for performing the defined tasks, e.g., development, production, etc. This factor includes the effects of programmatic schedule

decisions, the inherent errors in the schedule estimating technique used, and external physical constraints.

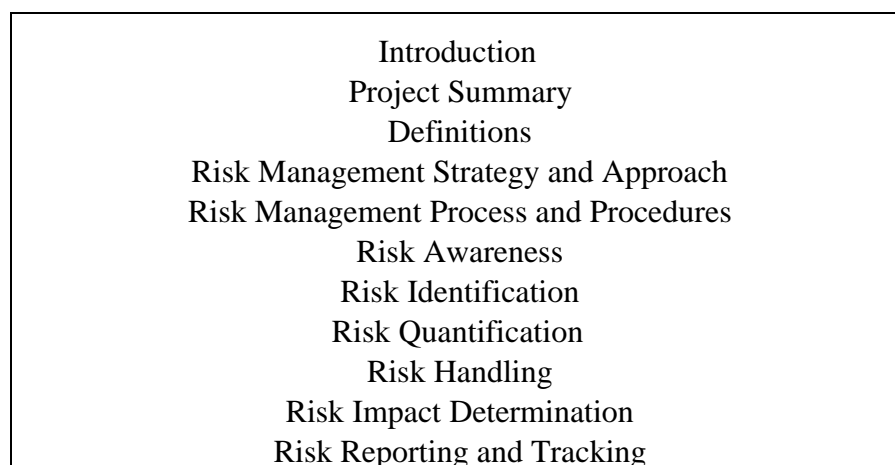
- Stakeholder, Legal, and Regulatory. The sensitivity and degree to which these areas will impact the planning, performance, scope, schedule, and cost of the project.

There are additional areas, such as manpower, systems engineering, quality, etc., that are analyzed during project development. The PM strives to pick the most appropriate areas, while still being inclusive, but not to the point of diluting the effort. The PM may consider these areas for early assessment since failure to do so could cause dire consequences/impacts in the project's latter phases.

### 9.2.3 Risk Management Plan

The RMP is the road map that tells the Department and contractor team within the risk environment how to effectively implement a new capital asset that meets the MNS. The key to writing a good plan is to provide the necessary information so the IPT understands the objectives, goals, and the PM's risk management process. Since it is a map, it may be specific in some areas, such as the assignment of responsibilities for Government and contractor participants and definitions, and general in other areas to allow users to choose the most efficient way to proceed. For example, a description of techniques that suggests several methods for evaluators to use to assess risk is appropriate, since every technique has advantages and disadvantages depending on the situation. Overall, the RMP is the AE's plan and concurrence on what and how the risk will be managed.

The Practice on risk contains an example of a RMP. A summary of the format is shown in Figure 9-3.



**Figure 9-3. A Risk Management Plan Outline/Format**

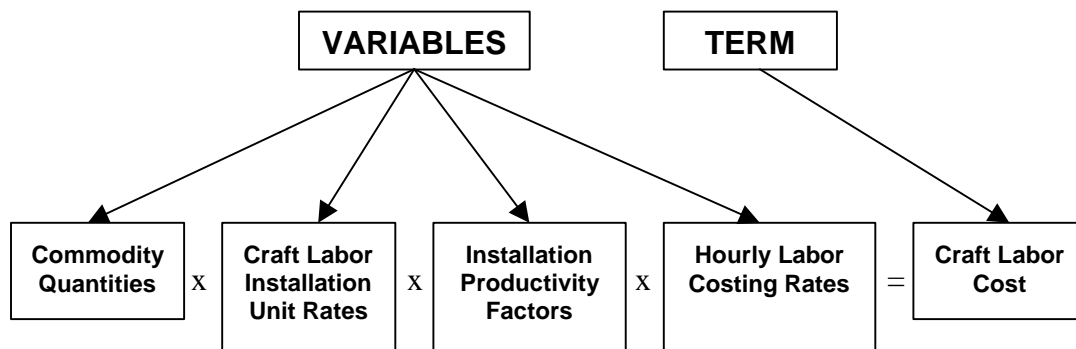
## 9.2.4 Risk Assessments and Cost and Schedule Estimates

Every project must also effectively address risk within the individual estimates and schedules. Project cost estimates assess the risks within the cost estimate and evaluate the confidence in the elements that make up the estimate. Since every one of the many parts that make up an estimate is subject to some uncertainty, the project must determine the uncertainty within each WBS element and the effect this has on the total estimate. A Monte Carlo simulation technique, utilizing the probabilistic determination method, is typically employed on projects and yields the probability of an overrun or under run of a project's cost at various levels of allocations. The use of probabilistic approaches yields a confidence level that is chosen commensurate with the risk that a project plans to accept. This approach should only be applied after deterministic risk analysis has been performed to analyze the risks and mitigation strategies have been formulated.

A model of the cost estimate is constructed, addressing all the cost components that make up the estimate, excluding the contingencies (i.e., Estimate Allocation, Technical and Programmatic Risk Assessment Allocation, and Schedule Allocation) which will be subsequently determined. This model represents and reflects the summary logic and approach utilized in preparing the cost estimate. It lists the various cost components of the project, such as labor cost, material cost, equipment cost, indirect/overhead cost, escalation cost, etc. These are known as "terms" in the model. Each cost component has a dollar value, which is its "weight" in the model. Elements that make up and affect each "term" are also listed. These are known as "variables" in the model. Typical "variables" that are addressed in the model include:

- Scoping
- Quantification
- Labor installation unit rates
- Labor productivity factors (location and work conditions may modify the labor installation unit rates)
- Labor costing rates
- Material pricing
- Equipment pricing
- Subcontract pricing
- Escalation rates
- Indirect/overhead rates.

An example of the "variables" that make up and affect the "term" "craft labor cost" is shown in Figure 9-4.



**Figure 9-4. Estimate Allocation Analysis**

After the model has been constructed, the estimator and other project team members estimate the confidence levels for each “variable.” This constructs a probability curve for each “variable.”

A Monte Carlo simulation computer software program is employed which uses a series of searches, sorts, and iterative logic routines to evaluate the data in the model. Utilizing a Monte Carlo simulation technique and the probability distribution of each “variable,” a variable value is obtained by drawing randomly from the variable’s probability distribution. In a similar manner, selections are made for each variable value from its respective distribution. This set of variable values is then substituted into the model and the first sample value of the dependent variable (TPC) is computed. Subsequent values of the dependent variable are obtained by drawing a large number of sets of activity values (e.g., 1,000 to 2,000 passes through the model). A probability distribution of the TPC is then produced. This information will yield an analysis of the relative risk and probable odds of overrunning or under running the projects estimated cost.

Outputs from Monte Carlo simulation software may consist of reports and graphs that address:

- Total risk allocation versus probability of overrun
- Probability distribution
- Relative contribution of variables
- Variable distribution versus allocations contribution
- Mean and standard deviation.

This information is used by management as a decision-making tool in determining the APB, and for contracting and setting the contract budget baseline (CBB).

# 10 PERFORMANCE MEASUREMENT, EVALUATION, REVIEWS, AND REPORTING

In managing projects, the PM employs tools and techniques that provide insight into the progress being made on the project. The objective is the availability of accurate reliable data that facilitates understanding of the status and possible trends. The purpose of this objective to ensure that PMs, staff and contractors are able to proactively manage projects and intervene when and where necessary to correct and recover the project does not progress according to plan. The early part of this Manual was focused on developing good plans. This area focuses on understanding performance and progress.

The level of control and information necessary is dependent on factors such as the complexity of the project and the type of contract. However, each project must have a process for determining progress and performance. **No later than final APB approval, every project shall have a functioning performance management system (PMS).** The performance management techniques most-often applied on government acquisition contractors and efforts include Earned Value, award fee, performance incentives, and performance indicators. While these methods of measurement and their application are described here, there are other performance management techniques that may also be used (e.g., cost-sharing incentives). Project reviews and reporting are key components of the planning and execution processes. They provide verification and assurance that the need can be met and they provide project status and progress against the plan.

## 10.1 PERFORMANCE MEASUREMENT—GENERAL

Measuring and reporting project performance on a periodically is a primary project management responsibility and demonstrates progress in the project. Performance measurement provides the capability to:

- Assess the results of activities compared with planned goals
- Determine progress toward achieving the project's mission
- Improve performance at all organizational levels
- Provide the basis for making informed management decisions
- Keep responsible organizations and stakeholders apprised of successes, problems, progress, and results

- Provide a common link between planning, budgeting, initiation, definition, execution, and evaluation
- Provide a basis for establishing accountability.

### **10.1.2 Measurement Considerations**

In developing metrics to assess performance against baselines, consideration may be given to ensure the following:

- A Project WBS is the foundation for all baselines
- Technical scope is defined for all work elements
- Schedule and cost baselines are traceable and linked to each other and to the technical baseline
- The technical baseline is traceable and linked to the project mission
- The level of baseline detail is commensurate with the project phase, and tailored as appropriate.

The following summary four-step process highlights the process involved in developing and using a performance measurement system:

- Planning (identifying and defining the metrics to be used)
- Measuring (achievement/progress/performance)
- Comparing (performance with goals)
- Correcting (identifying corrective actions for unacceptable performance).

As a project progresses from Initiation through Transition/Closeout, performance measurement criteria should be periodically reviewed and updated. Metrics or criteria not being met (performance varies from plan) are reviewed and evaluated to determine the reason(s) for the variance(s) and to identify corrective action(s). This review may involve all project team members and can identify existing problems, potential problems, corrective actions, responsible individuals, and completion dates.

As discussed elsewhere in this Chapter, metrics are a “broad” measurement while earned value is directly linked to project scopes, i.e., technical, schedule, and cost. If desired, metrics can become earned-value items by linking them directly to cost and schedule baselines.

A consistent relationship must exist between performance measurement, strategic planning and budget formulation.

## **10.2 EARNED VALUE MANAGEMENT SYSTEM**

An Earned Value Management System (EVMS) at its most basic provides the means to earn value for work elements completed against a plan that was established at the start of the

project. The primary component of an EVMS is the management system that is established to provide the means for tracking and measuring progress. The primary purpose of the EVMS is to provide information for those who manage projects. Accurate and reliable information is critical to the management process. EVMS guidelines incorporate best business practices and are high level to permit flexibility in adapting them to meet specific management styles and business environments.

The basic approach to implementing an EVMS includes:

- Correlating the project's technical, scope, schedule, and cost elements with the project WBS
- Planning all work that the project is to complete
- Integrating technical, scope, schedule, and cost elements into a baseline plan at the work control account level against which performance (accomplishments) can be measured
- Objectively assessing accomplishments at the work performance (work package) level
- Analyzing significant variances from the plan and forecasting the impacts
- Providing data to higher levels of management for decisions, and for identifying and implementing corrective actions.

**For projects having a TPC greater than \$20M, the PMS shall be an EVMS that fully complies with ANSI/EIA-748.** Projects having a TPC greater than \$5M, the application of performance measurement should be imposed on contractors, suppliers, vendors, manufacturers, and support organizations, as appropriate. For projects having a TPC less than \$20M, implementation of the standard is not required. Systematic measurement of baseline performance should be conducted by each project in order to measure and compare planned vs. actual accomplishments and costs. The performance measurement activity monitors the quality and utility of technical, scope, schedule, and cost baselines. This activity recognizes that the primary goal is improved management, better control, and informed decision-making, not just measurement.

### **10.2.1 EVMS Fundamentals**

The essence of earned value management is that at some level of detail appropriate for the degree of technical, scope, schedule, and uncertainty, a target value (budget) is established for each scheduled element of work. As work is completed, target values are "earned." As such, work progress is quantified and earned value becomes a metric against which to measure: the funds spent to perform the work, and the work scheduled to have been accomplished.

Schedule variances (not seen in a stand-alone budget versus actual cost tracking system) are identified and quantified. Also, cost variances are true cost variances that are not distorted by schedule performance. This provides early awareness of true/unmasked performance

trends and variances from baselines, and allows management to make informed decisions while there is time to implement corrective actions. Without the use of earned value concepts, a manager can generally only compare planned with actual expenditures. This comparison, however, does not provide any indication of the planned work that was accomplished or not accomplished.

For earned value benefits to be realized, planning along with the establishment and maintenance of a baseline for performance measurement are necessary. Advance planning, baseline maintenance, and earned value analysis yield earlier and better visibility of project performance than that of nonintegrated methods of planning and control.

### **10.2.2 EVMS Standard ANSI/EIA-748-1998**

The EVMS Standard ANSI/EIA-748-1998 contains 32 “guidelines” that are sorted into five major categories:

- Organization
- Planning, scheduling, and budgeting
- Accounting Considerations
- Analysis and Management Reports
- Revisions and Data Management.

These 32 guidelines evolved from what previously were called “criteria” (35) under the Cost/Schedule Control System Criteria (C/SCSC) developed in the 1960’s.

The Standard also contains a section on “Common Terminology” which provides definitions of the terms and concepts used to build and understand the application of EVMS. In addition, a section, “EVMS Process Discussion,” is provided to aid in the understanding and application of earned value management techniques. The additional sections of the Standard provide a comprehensive and practical understanding of the principles of earned value management. This understanding, however, may be coupled with actual experience in the application of the principles and guidelines in a comprehensive business management system environment.

#### ***10.2.2.1 EVMS Implementation***

In designing, implementing, and improving an EVMS, the objective is to do what makes sense. An EVMS that complies fully with the intent of ANSI Standard EIA-748-1998 will exhibit the characteristics of a good EVMS. Some of these characteristics include thorough planning; information broken down by organization and product; objective measurement of accomplishing tasks against the EVMS; summary of the level where work is performed, reported to management for use in decision-making; improved reporting discipline; and implementation of management actions to manage risk, cost, and schedule performance. The



responsibility for developing and complying with the standard resides with the performing organization, whether contractor or the government. An Earned Value Management System Implementation Guide (under development) will be provided for use in implementing an EVMS.

The degree of compliance is not only in the number of criterion met, but in the form and substance of meeting each criteria. In some cases, certain criterion may not be applicable or feasible. For projects where this is the case, the management control system plan should discuss those criterion. Projects with a low level of complexity and risk, such as construction of a building may not require the same rigor associated with a more complex project requiring significant and sometimes concurrent technology development, engineering, procurement, and implementation.

All Department contractors executing acquisition projects will implement an EVMS that meets the criteria of ANSI/EIA-748-1998. If, at the time of award, the contractor's EVMS has not been recognized as complying fully with the Standard, the contractor must be prepared to demonstrate that the system complies with EVMS criteria. The contractor will request certification of their system by the Department. The certification authority for the Department of Energy is the OMBE. **All Earned Value Management Systems shall be certified by OMBE. Existing systems shall provide a system description or other equivalent documentation to OMBE that demonstrates compliance with ANSI/EIA 748-1998.** This may be obtained as early as possible in the project, but in all cases will be obtained prior to establishing the APB (Critical Decision-2).

For existing systems, OMBE may require an implementation review. Such reviews should be scheduled as early as practicable and should be conducted within 180 calendar days after the contract award, the exercise of significant contract options, or the incorporation of major modifications.

The objective of the review is for the Department and the contractor to jointly assess compliance with the standard. This will be accomplished by assessing specific areas, such as the contractor's planning, to ensure complete coverage of the statement of work, logical scheduling of the work activities, and adequate resources allocation.

**Once an EVMS system has been approved, all significant proposed changes shall obtain OMBE concurrence prior to implementation.** The Government will advise the contractor of the acceptability of such changes within 30 calendar days after receipt of the notice of proposed changes. If the advance approval requirements are waived by the Government, the contractor should disclose EVMS changes to the Government at least 14 calendar days prior to the effective date of implementation. The EVMS approval authority is also authorized to approve a waiver.

The contractor will provide access to all pertinent records and data requested by the Government or duly authorized representative. Access permits Government surveillance to ensure that the EVMS complies, and continues to comply with the criteria.

Contractors will, at the discretion of the Government, provide documentation that a Federal agency has previously recognized that their system complies with the criteria of the standard. OMBE should be provided a copy of all approvals for all projects issued by Government project offices or Program Offices.

If the contractor has a system that does not meet the standard or has not been recognized by a Federal agency as compliant with the standard, the contractor should submit a comprehensive plan for compliance with the EVMS criteria.

The EVMS should:

- Describe the EVMS the contractor intends to use in performance of the contract
- Distinguish between the contractor's existing management system and modifications proposed to meet the criteria
- Describe the management system and its application in terms of the criteria
- Describe the proposed procedure for administration of the criteria as applied to subcontractors
- Provide documentation describing the process and results of any third-party or self-evaluation of the system's compliance with EVMS criteria.

If the contractor proposes to use a system previously approved by the Department or other Federal agency, the project office, or Program Office should submit a memorandum to OMBE stating that the project will use a previously approved system, and include the particulars of that approval. An EVMS that was previously approved for a small project may not be deemed as adequate for a MS.

The contractor should provide information and assistance as required by the Government to support review of the EVMS. If a contractor is responsible for an entire site location that requires execution of projects, a site certification may be requested and issued upon review or assessment.

Contractors should identify the major subcontractors, or major subcontracted effort (if major subcontractors have not been selected), that are planned for application of the criteria. The prime contractor and the Department should agree to subcontractors selected for application of the EVMS criteria.

### **10.2.3 Performance Measurement Baseline**

The assignment or allocation of budgets to scheduled segments of work produces a plan against which actual performance can be compared. This is called the Performance

Measurement Baseline (PMB). The establishment, maintenance, and use of the PMB are indispensable to effective performance measurement. The PMB should be in place as early as possible after establishing the APB. The relationship of individual work tasks with the time-phased resources necessary to accomplish them is established at the control account level. When practicable, all control accounts should be planned, at least at a summary level, to the end of the contract. Any control accounts that cannot be established in the initial planning effort, may have the critical defining event(s) that are necessary for planning identified, and made an item of continuing management interest.

***Summary Level Planning Packages.*** When it is clearly impractical to plan authorized work in control accounts, budget and work may be identified to higher WBS elements for subdivision into Control Accounts at the earliest opportunity. The budget for this effort should be identified specifically to the work for which it is intended, be time-phased, have its value periodically assessed, and have controls established to ensure this budget is not used to perform other work. The maintenance of realistic budgets, directly tied to an established scope of work, is essential for each organization responsible for performing project work. Eventually, all work will be planned by specific organizational elements to the cost account level. This is frequently accomplished by using a “rolling wave” technique. Planning horizons can be used to establish reasonable control account level assignments of work and budget. Summary level planning is not a substitute for early and definitive detailed planning.

***Authorized, Unpriced Effort.*** For authorized, unpriced work, the contractor may plan and budget near-term effort in control accounts, with the remaining effort and budget planned in summary level planning packages or maintained in undistributed budget during the period of negotiation. After definitization, the remaining effort will be planned and budgeted within control accounts as soon as practical.

#### ***10.2.3.1 Considerations in Developing Performance Measurement Baselines***

Once a project has subcontracted for all or part of an APB, the earned value process should address the requirement that the performing organization is to integrate budget and work planning requirements and provide time-phased performance reports. This requires the development of a PMB that is a subset of what is generally the CBB. Figures 10-1 and 10-2 highlight the essential elements of a CBB and PMB. The APB is not shown in Figures 10-1 and 10-2 because it would normally consist of several CBBs.

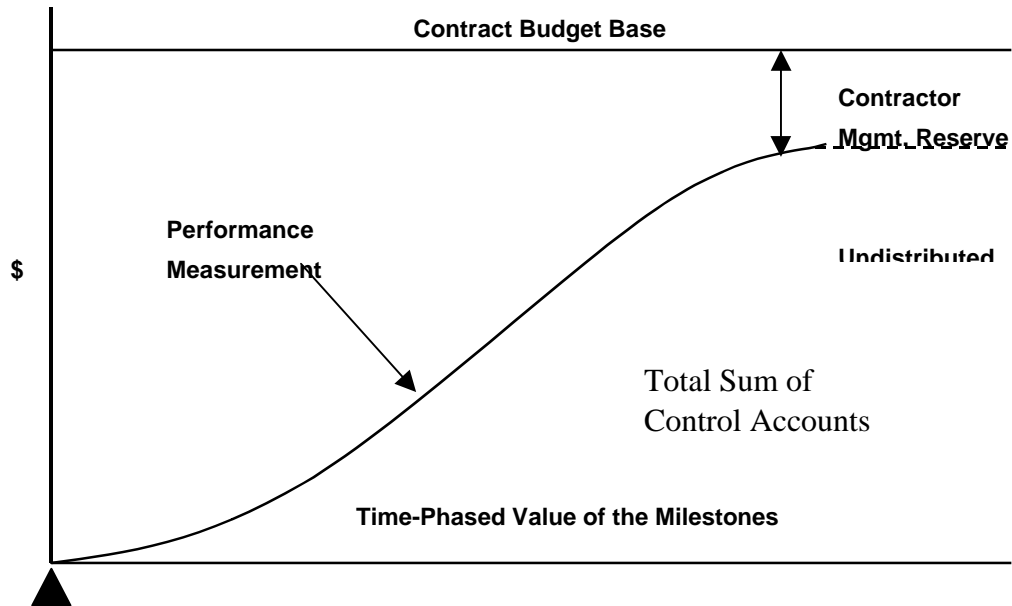


Figure 10-1. Performance Budget Baseline

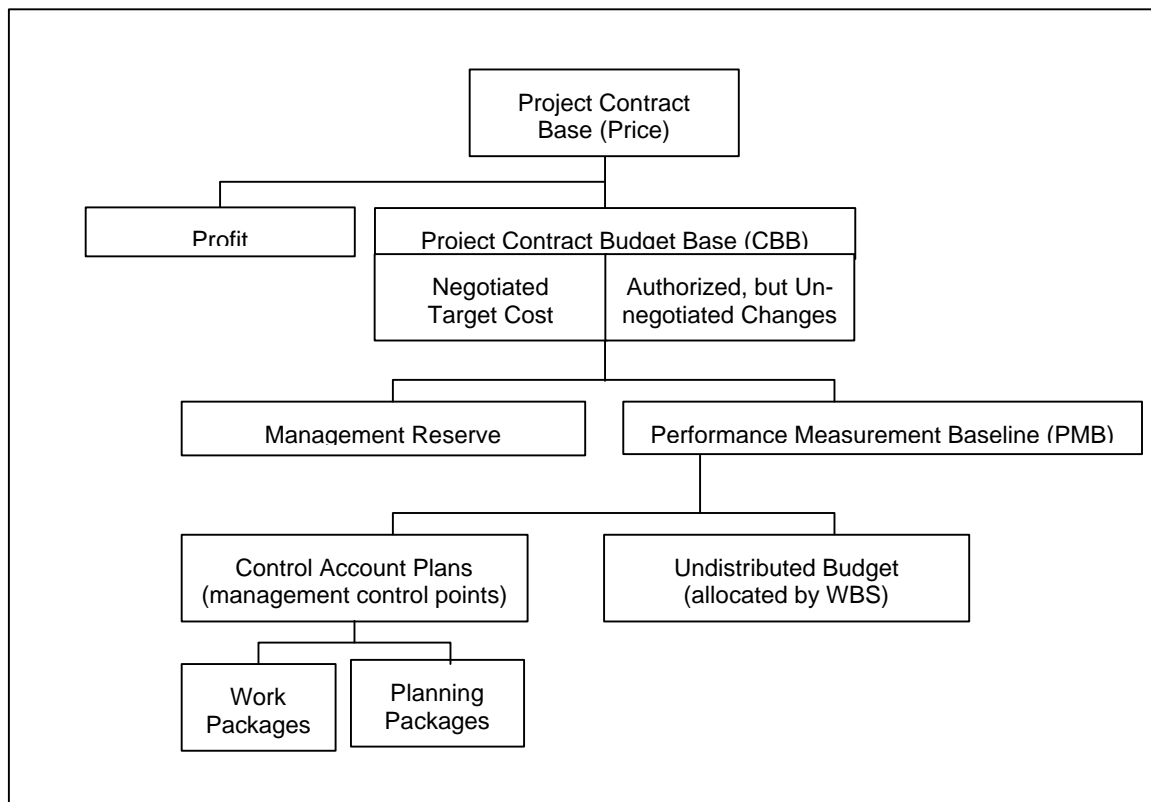


Figure 10-2. PMB for a Complex Project

In establishing the APB, an analysis of the risk and the resultant cost is performed which identifies risk allocations associated with both the schedule and cost baseline. Generally, for large and complex projects, this is done with a statistical model that provides various confidence levels of success. PMs should understand the schedule and cost risk adjustments and maintain adequate control of the buffer/trade space between the TPC and the Contract Budget Base. Contingency is that budget held by the Department office and is not put on contract. The risk-based approaches applied in creating the APB provides the needed data to understand and establish the CBB and resulting PMB. This risk-based approach accounts for schedule and cost estimating uncertainties inherent in formulating the APB TPC, and hence setting or agreeing to the CBB. These techniques help establish an 80% to 85% under-run confidence level for the TPC (Figure 10-3).

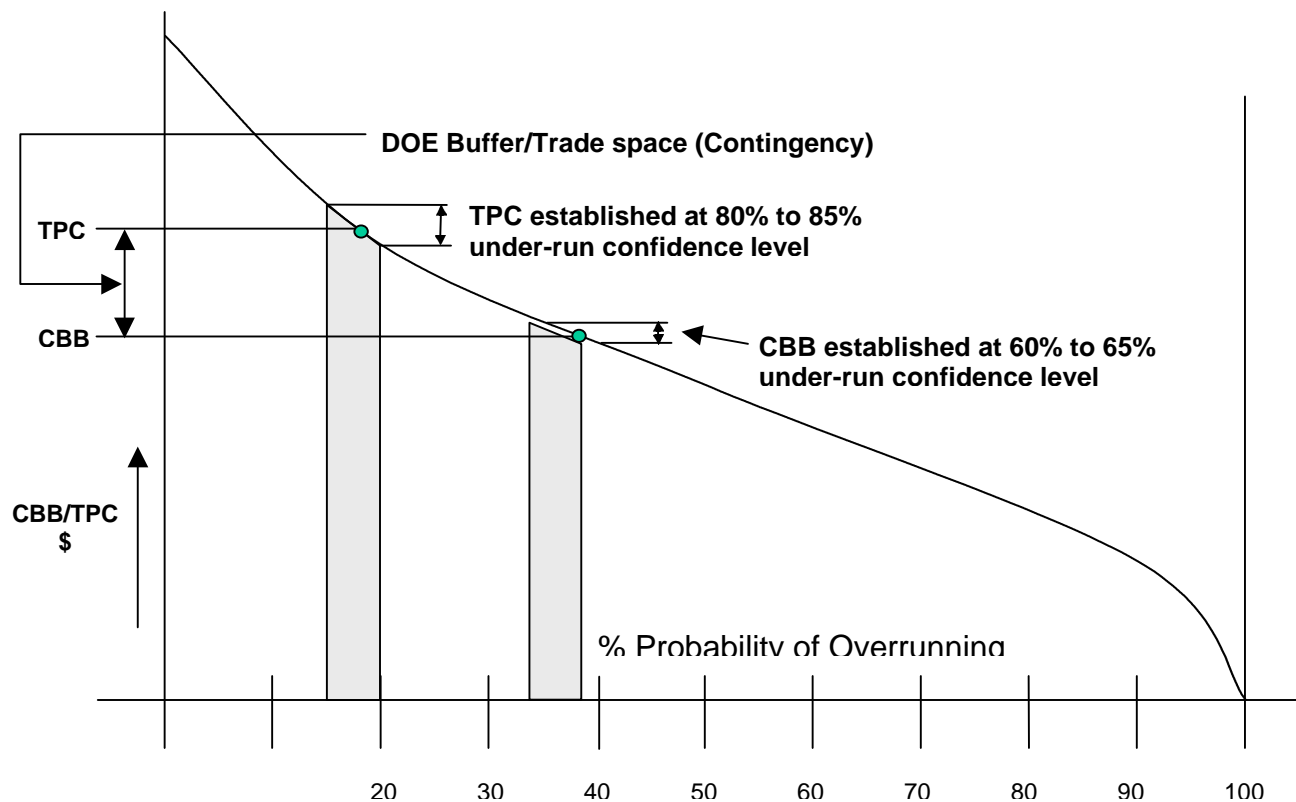


Figure 10-3. Utilizing Monte Carlo Simulation in Establishing the CBB

The probability and cost distributions assigned to the probabilistic simulation (generally a Monte Carlo or other techniques) should account for all uncertainties, including the degree of scope and design definition, maturity of technology, first-of-a-kind efforts, project cost structure, funding profile assumptions, and potential cost impacts due to scheduling uncertainties. If all these uncertainties are not captured in the simulation elements, then the 80% to 85% “confidence” level is likely to provide a false and misleading sense of security. The PM is responsible for selecting the process to establish the confidence level and for project completion within the resulting TPC. The risk-based allowance using this approach

establishes the project's CBB at the 60% to 65% under-run confidence level at the start of the project. During project execution, the DOE risk-based allowance is transferred to the CBB via documented change control in response to events/changes that are not within the contractor's control.

No mandatory confidence levels have been established. Probabilistic analysis yields information that is used, along with other information, to make decisions regarding the acceptance of risk. The output of such analysis is highly dependent on the variables chosen for the input to the simulation which have a direct impact on the uncertainty component of the output. The confidence levels that are discussed in this Manual are not absolute or exact. They are only indicators about maturity and risk. Critical judgments must still be made when defining the costs and schedule that comprises a part of the baseline.

### **10.3 PROJECT MANAGEMENT METRICS**

Project management metrics and earned value are similar in intent, yet different in execution. They are similar in that both are used to evaluate/measure project progress and performance. Earned value uses the total budgeted value of that portion of the scheduled work that was actually accomplished (Budgeted Cost of Work Performed). It is thus directly linked to the details of the project schedule, cost estimate, and technical baselines. On the other hand, performance metrics, are stand-alone measures of physical progress, such as:

- Material quantities to be processed: mass, volume, number of containers, handling units
- Documents delivered: Safety Analysis Report, PEP, Seismic Study
- Products delivered: yards of concrete placed, tons of rebar installed.

Typical metrics/performance indicators used on Department projects include the following:

- Milestone Reporting. All project milestones are statused on a monthly basis, identifying scheduled completion dates, actual completion dates, and forecast completion dates for milestones expected to be different from those scheduled.
- Technical Progress Indicators. Certain product or production-oriented parameters are evaluated/measured periodically and compared to time-phased plans for measuring schedule performance. Examples of such indicators include gallons of waste processed, number of drums produced, tons of soil removed, or cubic yards of concrete placed.

While these indicators provide an accurate measurement of schedule performance, they do not translate to the direct measurement of cost performance. However, the progress-to-date and forecast schedule completion dates are useful. For example, waste stream data is periodically provided at a customer's request and used along with similar information from other Department sites for quarterly tracking of national cleanup information.

Regardless of the performance measurement techniques implemented on a project, each project should develop points in the schedule that can be used to show progress and completion of interim milestones. Project typically will define at least two but no more than four incremental milestones per year to provide meaningful indicators of progress and performance. Other meaningful metrics are also employed. These metrics are reviewed and approved by the PM and included in the PEP. These metrics usually prove most useful if the progress of a tracked item is provided in graphical form (e.g., pie chart, histogram, bar chart). Metrics are also useful in evaluating subcontractor performance. Appropriate measures are normally identified in a subcontract so there is agreement with suppliers on the expected performance.

Internal processes may also be evaluated using metrics. For example, the time required to review design packages, types and number of review comments, number of surveillances and audits performed, number of welds radiographed, and so forth.

Safety is an important area where metrics are often used to measure company, organizational, project, and subcontractor performance. Typical examples include lost-time accidents, reported injuries, attendance at safety meetings, contamination incidents, radiation exposures, and so forth. In these cases, project performance can be compared to company performance, Department performance, industry performance, and past-period performance. In the case of safety graphs and curves, a secondary use is projecting future performance and identifying needed training.

## **10.4 PROJECT REVIEWS**

Reviews are part of the planning process and are used to assist the PM and upper-level management in developing project plans and verifying that the project mission will be met. Reviews provide information to help make decisions, and demonstrate and confirm a project's accomplishments at various stages. In progress reviews present EVMS indicators when EVMS is employed. Such indicators include, as a minimum, Cost Performance Index, Schedule Performance Indexes, Estimate at Completion, Estimate to Complete, and a trend of management reserve use. Cost Performance Indexes/Schedule Performance Indexes should employ a three or six month rolling measure to Level-3 of the WBS for most projects. The objectives of reviews include:

- Ensure readiness to proceed to a subsequent project phase.
- Ensure orderly and mutually supportive progress of various project efforts.
- Confirm functional integration of project products, and efforts of organizational components.
- Enable identification and resolution of issues at the earliest time, lowest work level, and lowest cost.

- Support event-based decisions.
- Control risk.

Two major functions of the PM and the IPT are to prepare project status reports and to conduct project status review meetings. Properly planned and presented, these efforts reduce the number of information requests imposed on the project. These two activities are to be timely, informative, and accurate.

Reviews communicate information on current status, progress, completeness, correctness, or work completion. Reviews include users, suppliers, contractors, managers, stakeholders, and peers. Under the direction of the PM, the project should involve the user in organizing, scheduling, and presenting project reviews. One or more of the following types of reviews are performed in support of DOE projects:

- **Regular/Periodic.** Involves project status, trends, design and construction progress for systems and interfaces. These reviews include monthly reviews, quarterly reviews, peer reviews for development work, and so forth. All are an integral part of ongoing project activities.
- **Special Areas of Concern.** Involve critical technology, hazards, special procurements, etc. Some of these reviews can be planned and budgeted in advance, others will be on an as-needed basis. All such unplanned reviews are funded by the project.
- **Event-Driven.** Involves mission validation, Safety Analysis Report, baseline validation. These reviews are necessary to obtain approval to proceed to follow-on project phases. These reviews are an integral part of a project and are planned in advance; most are performed by independent entities.
- **Unscheduled.** Could involve the General Accounting Office, Defense Nuclear Facilities Safety Board, DOE Headquarters, or the user. Generally performed on projects with high Congressional visibility or projects that experience schedule or cost difficulties. For large, visible projects these reviews may be anticipated and planned, and should include both schedule and cost components.
- **Status Reviews.** Performed to determine the current condition of a project or activity. For example, progress towards completion, compliance status, or readiness to proceed. Reviews could include items (project baseline, requirements, subsystem, or the project end product), or activities (planning, design, or construction). These reviews can involve management and/or the user. Products from these reviews include review plans, review reports, action item lists, and action item resolution reports.
- **Design Reviews.** Design reviews determine if a product (drawings, analysis, or specifications) is correct and will perform its intended functions or meet requirements. These reviews are peer or internal reviews and are an integral part of the project test and evaluation effort and may be planned as such.



Reviews are generally organized and provided by project personnel, including contractor and subcontractor personnel. Others are used when needed, such as technology experts, engineering management, senior management, the end-product user, and appropriate stakeholders. A review has a specific objective and the performers plan the review to meet the objective. Review information is generally presented in a meeting setting with the review participants questioning the presenters to assure a thorough understanding of the material. Unresolved issues are placed on an action-item list and the action assigned to individuals for resolution within a specified performance period. A review report is prepared that summarizes the results of reviews and includes a list of unresolved or open issues and responsible personnel. Resolutions of unresolved issues noted during a review are documented. Critical design reviews, Critical Decision-0 through Critical Decision-4, held during a project life cycle, assesses the status of a project in order to obtain approval to proceed to the next phase.

Reviews are an important project activity and should be planned as an integral part of the project, based on project complexity, duration, and Critical Decision points. Additional reviews may be requested by the user or management. The PM is to establish a balance between a need-to-inform and the cost of providing reviews.

#### **10.4.1 Project (Program) Management Reviews**

Formal Project (Program) Management Reviews (PMRs) to senior leadership are often necessary when the project complexity, cost, or concerns warrant such a review. The PMR provides a forum to communicate status and ensure continued support from senior executives within the Department. For all projects, the appropriate AE is to conduct a quarterly project performance review with the PM and staff (see Table 2-2). The SAE should conduct quarterly reviews of selected projects as scheduled by the Under Secretaries (see Section 2.3). These reviews provide both information exchange and more detailed information than that provided in status reports.

The contractor may participate in quarterly reviews as appropriate. The review schedule and agenda are coordinated with OMBE. OMBE is invited to participate in the reviews with the senior managers, and OMBE is invited to participate in all project quarterly reviews. A performance review can take many forms. Generally, it is a PM presentation of current program/project status. The performance review is scheduled on a consistent periodic interval to help ensure the attendance of all interested parties, and to avoid the possibility of long periods of time between reviews.

Performance reviews provide opportunities to provide more specific and detailed project information than possible in a structured, formal status report. These meetings provide opportunities to respond to questions or concerns, discuss future actions and activities, identify needed user or contractor support, and discuss actions or decisions by external entities influencing the project (e.g., OMB, EPA, Congress, Defense Nuclear Facilities

Safety Board). Finally, these meetings are a forum for identifying, discussing, and resolving issues (or assigning actions) before issues become a problem.

## **10.4.2 Independent Reviews**

Peer and/or independent reviews are an important project management tool and serve to verify the project's mission, organization, development, processes, baselines, progress, etc. Reviews may be initiated internally by the project to provide assurance of a particular technology or other facet of the work, or may be independent and conducted by an external, non-advocate organization. Reviews may be scheduled or unscheduled to meet a specific objective or need, such as a budget validation or a Critical Decision request. The scope of a review is dependent on the cost/complexity of the project and its current status.

The project may also experience reviews that are initiated by other governmental agencies such as the General Accounting Office, Office of the Inspector General, Defense Nuclear Facilities Safety Board, or others. These reviews need to be conducted with as little project impact as possible. The Department recognizes that independent reviews are valuable in assessing the status and health of its projects. Independent reviews are conducted by a non-proponent of the project and may be combined for efficiency, as appropriate.

### ***10.4.2.1 External Independent Reviews***

An external, independent review (EIR) is conducted by reviewers from outside the project. EIRs are managed by OMBE, who in coordination with the program and project staff, selects the review team to perform such reviews. The scope and schedule are also defined by OMBE and coordinated with the program and project staff. The schedule is chosen to minimize impact on the project from conducting multiple reviews.

### ***10.4.2.2 Independent Project Review***

An IPR is conducted by reviewers from within the Department. The Deputy Secretary as the SAE, or the PAS, the Operations/Field Office Manager, Program Managers, and PMs can request, authorize, or conduct IPRs as required. The OMBE is included as an invited observer for all planned reviews. OMBE coordinates the extent of participation with the appropriate organization on a case-by-case basis. Members of an IPR team are not drawn from the responsible Program Office, within a program secretarial organization, from related contractors from the project office, or from a related funding program.

### ***10.4.2.3 Independent Cost Reviews***

ICRs are used primarily to verify project cost and schedule estimates and support the Critical Decision-2 process in establishing project performance baselines. ICRs are part of the performance baseline EIR. However, an ICR or even an Independent Cost Estimate (ICE) may be requested at other times and for other reasons. The OMBE functions as DOE's

agent to establish contracts for ICRs. ICRs are documented in formal reports submitted to the SAE/AE by OMBE. Each ICR is reconciled with the current Program Office estimate.

#### ***10.4.2.4 Types of Independent Reviews***

The following reviews should be conducted on all projects having a TPC greater than \$5M:

- Mission Need IPR. This is a limited review of the project prior to Critical Decision-0. It validates the mission need and the funding request.
- Performance Baseline EIR. This is a detailed review of the entire project, including an ICR, prior to Critical Decision-2. It verifies proposed technical, scope, schedule, and cost baselines; and for projects with a TPC greater than \$20M it will also assess the overall status of the project management and control system.
- Executability Review EIR or IPR. This is a general review of the project prior to Critical Decision-3 that may range from an abridged review of specific areas within a project to a comprehensive review of the entire project. As a minimum, it verifies the readiness of the project to proceed into construction or remedial action. This review is an EIR for MS projects with a TPC greater than \$750M, and an internal review (IPR) for all non-MS projects. OMBE should be provided the IPR report for review prior to the Critical Decision meeting.

#### ***10.4.2.5 OMBE Mission Need and Acquisition Strategy Evaluation***

OMBE should review all MNSs and their justifications and ASs for projects having a TPC greater than \$5M as part of the Critical Decision-0 and -1 approvals, respectively. Program Analysis & Evaluation will review the MNSs and the OECM will review the ASs. These documents provide the bases for the IPT's consideration and conclusions associated with the alternatives, risk/risk trade-offs, AS, and planning that is required by Chapters 4, 5 and Chapter 9, Section 9.2.2.

### **10.4.3 Technical Reviews**

Technical reviews are necessary when uncertainty exists about the outcome of a project effort. If a design is new, untried, or unproven, and no standards against which judgments regarding viability can be made, then a review by appropriately trained and knowledgeable peers is in order. Specific types of reviews can include:

- Alternative systems
- Constructability
- Functions and requirements
- Preliminary design
- Detailed design

- Technology
- System verification
- Physical configuration
- Test readiness
- Functional configuration
- Operability and Reliability, Availability, and Maintainability.

#### 10.4.4 Operational Readiness Review

Although titled a review, an ORR is not a project review in the normally accepted use of the term. Rather, an ORR is an in-depth independent evaluation of the readiness of completed facilities, systems, equipment, procedures, personnel, and supporting and interfacing systems and organizations to begin facility operation. Because of the importance of this activity, ORR planning is initiated early in a project's life cycle. Planning may (as a minimum) include the project and the user organization and document decisions concerning assignment of responsible individuals, identification of resource needs, and preparation of a resource-loaded schedule. In most cases, the ORR is a DOE responsibility.

### 10.5 REPORTING

Status reports provide a customer and management with detailed project status information to support project decisions; and if necessary, identify and implement corrective actions.

Each project is responsible for preparing required reports appropriate for the project. All reports are thoroughly reviewed and approved by the responsible cost account managers and the PM prior to release. Typical reports are described in the following sections.

#### 10.5.1 Monthly Reports

Monthly project progress reporting is to be implemented after mission need approval. While all reporting elements for each project may not be available at this point, reporting what is available should be routine by the end of the Definition phase. **Each project shall report status and performance monthly utilizing the PARS, starting at Critical Decision-0.** OMBE will organize, coordinate, and direct project status reporting. Using the data elements, analyses, and other information specified in this Manual, the PM submits monthly and/or quarterly project status reports to line management, the Project Management Support Office, and the OMBE. Internal project reporting will begin at Critical Decision-0 with a comparison of contractor performance with the conceptual design schedule and cost plan, and a comparison of earned value performance against the alternative approval/range estimate at Critical Decision-1. The Program Manager and PM define the specific reporting requirements in the appropriate project documentation. At a minimum, reports for projects having a TPC greater than \$20M include EVMS performance and financial status.

At Critical Decision-2, the reporting is to be aligned with the approved APB, which is the performance baseline, once approved. PARS is used for tracking project status and performance. PARS is a web-enabled performance assessment and reporting tool used by each project to input monthly data. PARS can be found at <http://pars.energy.gov>. The system is entered by creating a project identifier that consists of the following three types of data:

- Identity or profile data. This is data that is entered one time and is used to identify the project, points of contact, and other identifying information.
- Event data. These are data elements that are associated with the life cycle of a project, such as decision data, milestones, budget, funding, and other information that changes infrequently.
- Status and performance data. This is information which may be available monthly from the contractor's project control system (and other sources) provides information on the progress and overall status of a project. Nearly all-static data elements will be found in the PEP and the PDS. In general, negative replies are not required. Where no data exists for a specific element, leave the field blank. Where a field is not applicable, no entry is required.

Creating a record involves entering both identity and event data. Most of this data can be obtained from the PEP, the PDS, or other similar documentation used in planning the project.

### 10.5.2 Quarterly Reports

**Quarterly project progress reviews and reporting (monthly) shall be organized and conducted upon approval of the Mission Need (Critical Decision-0). OECM shall be invited to all quarterly reviews for projects having a TPC greater than \$20 million.** The primary purpose of the quarterly report is to ensure that line managers are informed and have the opportunity to resolve issues and concerns. This report provides performance data, financial data, schedule and milestones status, and a narrative assessment of the project's current status. In addition, this report provides earned value data and the status of project milestones. The PM should submit quarterly project status reports using the data elements, analyses, and narrative information previously specified above. The report includes an assessment of project status by the DOE project staff. The report also identifies problem areas, corrective actions, and corrective action dates.

The PM and responsible DOE Program Office should determine additional reporting requirements. Agreements will be documented in the PEP. DOE Program Managers should provide project status reports on a quarterly basis, including their assessment of project performance, as required by the AE.

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# 11

## PROJECT CONTROLLING

Project controlling is the process of taking established requirements and baselines, and ensuring they are monitored and compared with actual and planned performance.

Several important over-arching project requirements are established when the DOE prepares and awards contracts that initiate activities associated with a project. The preparation, award and management of these contracts are an important and continuous DOE function. This effort is discussed in Section 11.1.

Preliminary order of range estimates for a project are initially established and approved at Critical Decision-1, and are further defined and formalized at Critical Decision-2. Control of APBs and performance baselines are also an important DOE function that continues throughout project performance and closeout. This effort is discussed in Section 11.2.

Project interfaces are an area of project activity that is vital to the success of a project, and too often not given adequate attention. This activity includes the identification, control and management of all project interfaces with other projects and non-project activities and entities. This effort is discussed in Section 11.3.

### 11.1 CONTRACT MANAGEMENT

All DOE projects are governed and controlled through contracts. This includes the contract between the DOE and the prime contractor(s) as well as those contracts between the project and the contractors/subcontractors that provide goods and services. Contracting begins early in a project's life, when the IPT is assembled and the focus is on developing the MNS and AS. Although many individuals play key roles throughout a project's life, the two most important individuals related to contract management are the PM and CO. The CO is the legal entity for all contract focus, including approval of contract changes. The PM has the ultimate responsibility for project success and is accountable for all project contracts. Additionally, the PM is generally identified as a Contracting Officer's Technical Representative, and as such may act as the CO in technical contractual matters. Under all circumstances, the PM, CO, and the IPT work together openly and constructively in fulfilling their roles through the project acquisition process. There are many facets of contract management, therefore, the PM needs to be particularly well-trained and experienced to effectively accomplish Government commitments.

### **11.1.1 Integrating Project and Performance-Based Contracting**

Substantial requirements and guidance is available throughout the Federal Government. A snapshot follows on how to integrate the desired, increasing focus on performance-based acquisition. As taken from FAR 2.101:

“Performance-based contracting (PBC)” means structuring all aspects of an acquisition around the purpose of the work to be performed with the contract requirements set forth in clear, specific, and objective terms with measurable outcomes as opposed to either the manner by which the work is to be performed or broad and imprecise statements of work.”

FAR 37.6 identifies five elements of PBC, they are; (1) Statements of Work, (2) Quality Assurance, (3) Selection Procedures, (4) Contract Type, and (5) Follow-on and Repetitive Requirements. At a high level, these are the activities that need to be developed, planned, and executed successfully within a given project and its procurements. From a project perspective, these elements are part of the plans and decision processes that are required as part of various project activities.

In PBC, as discussed in Section 1.2.4, the project-phased activities and Critical Decisions are designed to carry out these required activities, as well as others that are necessary to effectively deliver a new capital asset. Projects are made up of potentially numerous procurements. These procurements are to be integrated into the activities and decisions that are made by the Government during contracting, and after a contract is in place. For the DOE, this can at times get blurred due to the substantial use of contractors that have broad scopes and provide or support the technical and managerial expertise required for DOE missions. Regardless of the starting point, both project management and PBC approaches are timeline-driven, and may have to run concurrently in some instances, depending upon the starting point of the mission need (in or out of an in-place contract). The following seven-step process is adapted from existing Government information on PBC. It is important to note, however, that IPTs need to be well-trained in PBC approaches and kept up-to-date in lessons learned experiences that may be incorporated, in real time, into any project undertaking.

**Step 1.** Establish an IPT. This is sometimes referred to as an integrated solutions team, since their fundamental purpose is to find performance-based solutions to agency mission and program needs. This is a key step in all MNS development and specific requirements and guidance has been provided in this Manual.

**Step 2.** Describe and develop the problem that needs to be solved, and links to the Department’s Strategic Plan and objectives. Because a clearer, performance-based picture of the acquisition is to be the team’s first step, it is not yet time to retrieve the requirements from former solicitations, search for templates, think about contract type, incentives, decide on the contractor or the solution. This effort results in the MNS and includes early



preliminary planning documents such as the initial acquisition strategy, risk comparisons, and potential alternatives.

Step 3. Examine the potential solutions from both private and public sectors. The entire IPT needs to understand and have a common understanding of what features (high-level objectives, functions, and constraints), schedules, terms and conditions are key to the potential solution. Picking a specific solution is to be resisted and adequate planning time allowed to carry out the next two steps. This may include the entire project Definition phase (selecting, preparing and delivering the concept), or may be done during any phase as necessary to support a procurement. An example would be preparing for a conceptual design contract, technology development or a site characterization effort.

Step 4. Develop a high-level performance work statement at Critical Decision-2, Approve APB, and include it in the PEP. This statement will satisfy the next step as well as the requirements of OMB A-11. Below this level, performance work statements and/or statement of objective documents are used as part of the request for proposals. For a large, complex project this may take multiple contracts, but for a simplified System project (Section 4.2.1) it may be developed into one bid by a prime contractor and eventually bid and performed by a single contractor.

Step 5. Decide how to measure and manage performance. Measuring and managing performance is a complex process and requires the consideration of many factors. For a project having a TPC between \$5M and \$20M, contract requirements need to be developed that require a PMS; and for projects having a TPC greater than \$20M, a full EVMS is required that is in compliance with the national consensus standard, ANSI EIA-748.

Step 6. Select the right contractor(s). Bringing the acquisition strategy to fruition by implementing the project AS and selecting the right contractor is especially important in PBC. The contractor is to understand the PBC approach, know or develop an understanding of the Department's requirements, have a history of performing exceptionally in the field, and have the processes (project, safety, engineering, quality, procurement, etc.) and resources in place to support the Department's objectives and requirements.

Step 7. Managing performance. During the project phases of Execution and Transition/Closeout, all systems and plans are used to monitor, manage, and report performance. This is assisted by the three Critical Decisions (Critical Decision-2, -3 and -4), and includes appropriate reviews, performance measures, and reporting.

The above steps do not intend to highlight the entire project process—they are designed to help the PM and the IPT understand how to integrate the two concepts. PBC is a rapidly developing approach with numerous guides, web pages, and training classes on the subject. Additionally, the Practice on contracting and procurement provides additional discussion, guidance, and references on contracting and PBC.

### 11.1.2 Integrating Contractor Performance Data

The PM is responsible for incorporating the contractor's performance measurement data into the project's performance reporting system. The contractor's time-phased baseline budget is integral to the appropriate project cost accounts. The project's baseline budget should reconcile to the budgets in the contractor's baseline. The baseline schedule should reconcile with the project's master schedule. All contractor efforts should integrate with the project's WBS.

### 11.1.3 Review and Analysis of Contractor's Performance Data

The PM is responsible for performance analysis of the contractor's performance data using the information provided in the contractor's monthly performance reports. The PM may use members of the contractor's management team to review and analyze the contractor's performance reports. The PM should plan and perform regularly scheduled performance reviews with the contractor.

### 11.1.4 Contract Closeout

Upon completion of a contract's scope of work (as reported by the contractor), the PM should review the work performed against the scope of work planned (plus any changes) to verify satisfactory completion. Upon verifying completion, the PM notifies the Program Manager and the CO.

## 11.2 BASELINE CHANGE CONTROL

Baseline change control ensures that project changes are identified, evaluated, coordinated, controlled, reviewed, approved and documented in a manner that best serves the project. Errors, problems, opportunities, new management, or the availability of new methods or tools can trigger project changes. Uncontrolled changes lead to chaos due to the far-reaching effects that even small changes can have on the project's technical, scope, schedule, and cost baseline, as well as effects on safety, risk, quality, and products.

An approved project APB (see Manual Chapter 8 and the Practice on APB) is the highest controlling element of a project. Controlling changes within an APB should be an inherent element of project management that is directly related to the risks and uncertainties associated with a project. One key goal of baseline change control is to ensure APB threshold values are not exceeded. Baseline change control provides a system to approve and document project changes within the threshold values of an APB and allow for management of the objective values of the APB.

Project changes should be identified, controlled, and managed through a traceable, documented, and dedicated change-control process. **Project changes shall be identified, controlled, and managed through a traceable, documented, and dedicated change-**

**control process that is defined in the PEP and consistent with Table 2-3.** The goals of a baseline change-control process include:

- Anticipate, recognize and predict changes
- Prevent APB breaches
- Evaluate and understand the impacts of each change
- Identify, understand and control the consequences of changes
- Prevent unauthorized or unintended deviations from approved baselines
- Assure each change is evaluated, reviewed, and dispositioned at the proper management level.

### **11.2.1 Controlling Baseline Changes**

Baseline change control is to be established early in a project's life cycle, and as a minimum, be formal, organized, and functioning prior to requesting Critical Decision-2. Thus, the PM institutes a formal, demonstrable change control process to control changes to these baselines prior to submitting a request for Critical Decision-2 approval. A key responsibility of each PM involves controlling changes to project baselines.

The objective of the change control process is to ensure that changes are documented and formally resolved. Documenting and controlling change provides better mitigation, is necessary for EVMS and for accurate performance reporting and supports better management decision-making. The change control process is not intended to simply prevent changes, but ensures change control review and documentation. Therefore, changes are managed and controlled (as other project risks) by establishing a process for identifying, evaluating, and dispositioning change requests.

### **11.2.2 Change Principles and Processes**

Responsibility for change control exists at every management level, and changes are monitored at the appropriate level by CCBs. However, regardless of the source or the seeming innocence of a change request, the PM should be ultimately responsible for assuring requested changes are documented, evaluated, processed, and dispositioned.

### **11.2.3 Input to Change Requests**

A change control framework should be established or referenced in the PEP. The PEP also identifies the project baselines against which changes are monitored and controlled. Project baselines are to be continually compared against project performance and reported in monthly project performance reports.

Once a technical baseline has been established, formal, documented engineering change requests are the method of requesting changes. They should also be evaluated for impact on

schedule and cost baselines and, if impacting, also processed through appropriate change control. However, during design, change requests may be used to document and disposition minor design errors/changes, and during construction, field change requests may similarly be used to disposition minor field errors/changes. These methods of initiating changes, however, should be monitored, controlled, and approved based on a tailored change control process. In addition, all such changes should be reflected in approved project drawings and specifications.

#### **11.2.4 Change Control Board**

Each organizational level (as appropriate and documented in the PEP) should establish a CCB for disposition of baseline change proposals within their level of authority/control. For the Secretary of Energy, the ESAAB may act as a CCB. A CCB includes, as a minimum, a chairperson, a secretariat, and members and advisors as needed. The CCB chairperson should be responsible for change decisions, and is the change approval authority. Members and advisors are on the CCB to advise the chairperson about technical matters involving quality, reliability, financial, schedule, environmental, safety, health, and quality issues. Board meetings and decisions should be documented through meeting minutes and letters-of-decision. Procedures for establishing a CCB and defining the membership, authority, and operation of the Board should be included in the CCB charter or initiating document.

#### **11.2.5 Control Levels**

Four control levels govern baseline change control for DOE projects. Agreed upon thresholds limit the control each organizational element has over baseline change approval, and the change control process. The baseline objectives, APB threshold values, and associated change control thresholds for each project should be documented in the PEP, and approved at the Critical Decision-2 (APB) decision point.

All changes are inside the APB, if they exceed the KPP (cost and technical) of the APM it is to be handled as a breach. Level-1 for Under Secretaries and/or NNSA Administrator; and for Level-2 for the PAS. Level-3 typically resides with the Field, and Level-4 for the prime contractor.

#### **11.2.6 Change Initiation**

The initiator of a change proposal prepares the change request describing the change and identifying the amount of budget required or to be returned. The initiator also describes the scope of the change, any schedule impacts resulting from the change, and provides an analysis of the change. The analysis of a change should include the impact of the change on project technical, scope, schedule, and cost baselines and/or forecasts, as applicable. Included in the technical category are items like safety, quality, procurement, performance, personnel, training, ongoing operations, and so forth. That is, the analysis is to be all-inclusive and thorough. A proven, structured approach for evaluating the impacts of a

proposed change is obtained by completing a pre-established project change impact checklist for each change request. Change analysis and understanding is especially important during project Execution because of the large impact of seemingly small changes.

Each project should establish and maintain a change control log from which a unique number is assigned to each change request, and in which the title, scope and cost of the change is recorded, along with the disposition of the change and any assigned action items. If the change impacts project costs, then entries should also appear indicating the source of the funds needed to implement the change.

Often, a project change is caused by Congressional action, such as an Appropriations Act that reduces funding. In such cases, the PM should prepare a project change request and submit it through normal channels for review and approval. The change should be documented and approved by the appropriate SAE/AE within three months from the time the Congressional action is enacted (see Section 8.3).

### **11.2.7 Change Documentation**

A significant amount of documentation is, by necessity, associated with a project's change control system. This includes the change request and the change impact evaluation form; the change log; the CCB meeting minutes, and decision documents; and any budget, funding, schedule, design, procurement, construction, safety, etc. documentation. These documents should be preserved as part of the project's historical record, and should be identified, reproduced, distributed, filed, and preserved in compliance with the project's configuration management system.

## **11.3 INTERFACE MANAGEMENT**

All DOE projects have interfaces that should be managed. Typical interfaces include:

- Contracts/subcontracts
- Existing Site infrastructure
- Other projects
- Other Organizations
  - Congress
  - OMB
  - State Regulators
  - EPA
  - Defense Nuclear Facilities Safety Board.

Each of these interfaces could include:

- Communications
- Agreements
- Regulations
- Reviews
- Interface Drawings and Specifications
- Technical Requirements.

The PM is responsible for project interface management, and should exercise proper authority and control to assure proper management of each interface.

The objective of interface management is to ensure that structures, components, and organizations fit and function together properly to achieve project goals. Interface management is particularly important when system or component design is accomplished concurrently by different organizations, either internal or external. Interface management facilitates communication and understanding of technical requirements across internal and external boundaries.

Interface management is achieved by:

- Identifying interfaces and responsible parties to participate in interface development at the earliest stages of a project
- Identifying interface type, functions, and physical characteristics
- Identifying the functional and physical requirements and constraints of an interface
- Employing a rigorous, disciplined approach for developing, approving, and controlling all interface documents.

The principles of interface management apply to both new, refurbishment, and modification projects. The major participants in interface management include the PM, the prime contractor's project manager, contractors/subcontractors and suppliers, other DOE organizations and other outside organizations.

### **11.3.1 Responsibilities**

An interface involves at least two parties. Each party is responsible to check that their side of an interface integrates with the other side, and is also responsible to provide all information to define the interface. A lead organization (the interface owner) should be designated by management for specific interface definition and implementation actions. However, the PM is ultimately responsible for managing (or having managed) all project interfaces.

The organization (contractor, program, project, facility, DOE) that is responsible for a system, subsystem(s), physical component(s), or interfacing activity within a defined system

(or project) is the owner of all interfaces associated with those components. System responsibility during the various project life cycles should be defined by the PM and communicated to all participants so there is no misunderstanding. As the interface owner, such organizations are responsible for defining all interfaces and ensuring that interfaces are fully developed and integrated with other system interfaces, as delegated by the PM. The interface owner is responsible to:

- Prepare all documentation to fully develop and integrate identified interfaces. This may include preparing interface control documents/drawings and/or contract modification packages for external interfaces
- Ensure that all interface control documentation is reviewed by the appropriate organizations and the CO
- Establish temporary interface working groups as needed
- Approve final documentation and releases approved documentation in accordance with release procedures.

Typically, interface control working groups are organized to work on external and internal interfaces to ensure that interface information is fully developed and integrated with the project baselines and contract documentation, as appropriate.

### **11.3.2 Identify Interfaces**

The PM is ultimately responsible for identifying project interfaces, assuring each interface is assigned to a responsible individual for coordination/resolution, documenting activities on each interface, and tracking interface activities to assure none will adversely impact the project. **All necessary interfaces shall be documented using appropriate interface documents.**

The organization assigned responsibility for an interface should identify, document and categorize the interface appropriate to the project stage of development and the type of interface. For example, internal or external; organizational or physical; contractual or non-contractual; company-to-company; organization-to-organization; system-to-system; system-to-component; etc.

Interfaces should be documented using appropriate interface documents as determined by the PM. Interface Control Documents are used for physical interfaces, and memoranda of understanding or other written agreements are used for organizational interfaces. Once documented and approved, the interface information is integrated into the project database and maintained under change control.

As interfaces are identified, they are categorized, as appropriate.

### **11.3.3 Develop Interface Control Documentation**

The organization responsible for the interface categorizes interface information as either physical (systems, subsystems, components) or organizational and defines organizations having common interfaces. The level of definition will vary, but may be adequate to allow all parties involved in the interface to develop the work scope needed to fully define the interface and develop the appropriate level of interface documentation as described in the following paragraphs:

- Internal interfaces are either physical or organizational interfaces. These interfaces are documented to support design (drawings, specifications) and operations.
- External interfaces are either physical or organizational interfaces with other contractors. These interfaces are controlled and managed through an appropriate level of contract administration and technical documentation. Establishing and/or changing external interfaces requires the use of a contract modification. The contract modification documentation should establish responsibilities, agreements, and configuration item information. The contract modification documents are developed by all parties to an interface and when approved represent authorized contract work scope and deliverables between the companies. The various interface description documents used for internal interfaces can be used to develop external interfaces.
- Interface control drawings describe design features on both sides of an interface boundary to the extent required to control physical, functional, and operational compatibility between the affected equipment items and facilities.
- Engineering drawings that contain requirements controlled by an interface control drawing/document should be consistent with the interface boundaries and features contained in the interface control drawings/documents. Engineering drawings provide traceability to the interface control drawing/document.
- Engineering drawings contain the interface boundary identification, when required.
- The “owner” of the interface should establish an agreement upon the list of Interface Control Documents as part of the PEP, and should prepare such documents that will be eventually provided to the user on a checklist.
- Interface control drawings are prepared when required. The information to be included on such drawings includes: (a) general configuration, dimensional data, location data, weights and measures, etc.; (b) mechanical, electrical, hydraulic, pneumatic, optical characteristics; and (c) other characteristics that cannot be changed without changing the item design or function.

### **11.3.4 Review and Approve Interface Documents**

All documents prepared in support of interface management may be reviewed and approved per project procedures, entered into the project’s document control system, maintained under



change control, distributed to appropriate project participants, and included in final project document turnover.

### **11.3.5 Closeout**

Each project interface is managed (controlled, assigned, tracked) until completed (closed). Closeout is documented through a closeout form signed by the PM as well as the assigned responsible person. All closeout documents become part of the project's permanent documentation and are provided at turnover.

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# Appendix

## GLOSSARY

**The following is a list of definitions of terms that are unique or nearly unique to project management. Also included are terms that are not unique to project management, but are used differently or with a narrower meaning than in general everyday usage. Many of the terms have broader, or sometimes different, dictionary definitions.**

**Acceptance Testing.** The performance of all testing necessary to demonstrate that installed equipment and/or systems will operate satisfactorily and safely in accordance with plans and specifications. It includes hydrostatic, pneumatic, electrical, ventilation, mechanical functioning, and run-in tests of equipment, portions of systems, and finally of completed systems.

**Accrued Cost.** Amounts owed for items or services received, expenses incurred, assets acquired, or construction performed, for which a bill (e.g., progress billing, and other billings) has not yet been received or approved.

In an earned-value context accruals represent cost (liability) for work performed, and thus costs incurred, for the reporting period even though the bills have not yet been received. Thus accruals are included in the Actual Cost of Work Performed when reporting performance in the earned value system. It is essential that the accrual methodology be consistent with the time phasing of the Budgeted Cost of Work Scheduled. Note that the time phased Budgeted Cost of Work Scheduled should be consistent with the contractual obligations for procurement of goods and services.

**Accountability.** The requirement, obligation, or willingness of an individual to accept responsibility for the outcome, results and consequences of their actions and decisions. In a project setting, accountability is inseparable from authority and responsibility.

**Accountability Matrix.** See RESPONSIBILITY ASSIGNMENT MATRIX.

**Acquisition Executive (AE).** The individual designated by the Secretary of Energy to integrate and unify the management system for a project, and monitor implementation of prescribed policies and practices. Approves all appropriate Critical Decisions, with the exception of mission need which is to be approved by the designated approval authority. Selects from among competing systems those that are to be advanced to development, demonstration, and production/operation, and authorizes development of a noncompetitive (single concept) system.

**Acquisition Performance Baseline (APB).** Includes all cost, schedule, and performance parameters (both objectives and thresholds) for a program/project. It represents the DOE commitment to Congress to assess Total Project Cost (TPC). Key elements in formulating an APB include the integration and assessment of program/project scope, schedule, and cost baselines; a systematic risk analysis, and the development and inclusion of adequate risk allocation to address factors that might cause technical/schedule/cost growth during project performance. Project completion without an increase in the APB thresholds or extending the schedule, is the primary measure of success in formulating the APB.

**Acquisition Plan (AP).** Provides the procurement and contracting detail for elements of a program, project, or system. A formal written document reflecting the specific actions necessary to execute the approach established in the approved acquisition strategy and any appropriate guiding documentation. The AP is performance-oriented and provides the framework for conducting and accomplishing a project following MNS approval.

**Acquisition Planning.** The process by which the efforts of all personnel responsible for an acquisition are coordinated and integrated through a comprehensive plan for fulfilling the agency need in a timely manner and at a reasonable cost. It is performed throughout the acquisition's life cycle and starts with developing an overall acquisition strategy for managing the acquisition after MNS approval; and from a project standpoint, goes to project turnover.

**Acquisition Program/Project.** Acquisition programs and projects are distinct elements of work, equal to or greater than \$5 million, regardless of the funding source or type, that deliver or create a product, service, or capability, with a specified beginning and end, a stated cost, and expected performance objectives. They are directed, funded efforts whose purpose is to provide a useful, material capability in response to a validated mission or business need. An acquisition program may be facility construction, infrastructure repairs or modifications, system, production capability, remediated land, closed site, disposal effort, software development, information technology, space system, research capability, or other asset.

Acquisition programs, as they related to projects, are generally made up of multiple projects, related by a common mission, in which each project remains a useful segment and able to perform it's intended function.

**Acquisition Proponent.** The DOE component having the primary responsibility for research, development, demonstration, production or operation of a major system project (to include, when applicable, the system for its logistic support) that meets Departmental objectives in carrying out DOE missions.

**Acquisition Strategy (AS).** A business and technical management approach designed to achieve acquisition objectives within the resource constraints imposed. It is the framework for planning, directing, contracting, and managing a system, program, or project. It provides a master schedule for research, development, test, production, construction, modification, postproduction management, and other activities essential for success. The AS is the basis for formulating functional plans and strategies (e.g., acquisition strategy, competition, systems engineering, etc.). Once approved, it should reflect the approving authority's decisions on all major aspects of the contemplated acquisition. See ACQUISITION PLAN.

**Activity.** An element of work performed during the course of a project. An activity normally has an expected duration, an expected cost, and expected resource requirements. Activities are often subdivided into tasks.

**Actual Cost of Work Performed (ACWP).** Total costs incurred (direct and indirect) in accomplishing an identified element or scope of work during a given time period. See also EARNED VALUE.

**Acquisition Performance Baseline (APB).** A quantitative expression reflecting total scope of a project with integrated technical, schedule, and cost elements. It is the established risk adjusted, time-phased plan against which the status of resources and the progress of a project(s) is measured, assessed, and controlled. It is a federal commitment to OMB and Congress. Once established, baselines are subject to change control discipline (modified).

**Administrative Closure.** Generating, gathering, and disseminating information to formalize project completion.

**Allowance.** An incremental amount (technical margin, cost and schedule contingency) that is made part of an estimate or baseline and is expected to be required/costed when complete. It is normally developed from experience or risk analysis.

**Authority.** The power or right granted or assigned to an individual to (a) lead, guide, and direct an activity, (b) make decisions, (c) authorize action, and (d) influence or control other individuals. In a project setting, authority is inseparable from accountability and responsibility.

**Backfit.** The imposition of a new or proposed nuclear safety requirement that dictates the modification of, or addition to: (1) systems, structures, and components of a facility; (2) the existing or approved design of a facility; or (3) the procedures or organization required to design, construct, or operate a facility.

**Bar Chart.** A graphic display of schedule-related information. In the typical bar chart, activities or other project elements are listed down the left side of the chart, dates are shown across the top, and activity durations are shown as date-placed horizontal bars. Also called a GANTT CHART.

**Benchmarking.** An improvement process in which an organization, agency or company measures its performance against that of best-in-class organizations, agencies, or companies; determines how those organizations, agencies, or companies achieved their performance levels; and uses the information to improve its own performance. Benchmarking can compare strategies, operations, processes, and procedures.

**Beneficial Use or Occupancy Date.** The process by which a facility, portions thereof, or the last piece of principal equipment, is released for use by others, prior to final acceptance. Non-integral or subsidiary items and correction of design inadequacies subsequently brought to light may be completed after this date. On multiple-facility projects, beneficial use of the overall project will be the beneficial use date of the last major building or facility. This activity is always documented and approved by the responsible parties.

**Breach.** A project breach occurs when the current estimate of a performance, technical, scope, schedule, or cost parameter is not within the threshold value (APB) for that parameter. It is handled as a deviation, not through the normal change control system.

**Budget at Completion (BAC).** The total authorized budget for accomplishing the program scope of work. It is equal to the sum of all allocated budgets plus any undistributed budget. (Management Reserve is not included.) The Budget at Completion will form the APB as it allocated and time-phased in accordance with program schedule requirements.

**Budgeted Cost of Work Performed (BCWP).** The sum of the approved cost estimates (including any overhead allocation) for activities (or portions of activities) completed during a given period (usually project-to-date). See also EARNED VALUE.

**Budgeted Cost of Work Scheduled (BCWS).** The sum of the approved cost estimates (including any overhead allocation) for activities (or portions of activities) scheduled to be performed during a given period (usually project-to-date). See also EARNED VALUE.

**Capital Assets.** Land, structures, equipment, systems, and information technology (e.g., hardware, software, and applications) that are used by the Federal Government and have an estimated useful life of 2 years or more. Capital assets include environmental restoration (decontamination and decommissioning) of land to make useful leasehold improvements and land rights, and assets whose ownership is shared by the Federal Government with other entities. This does not apply to capital assets acquired by state and local governments or other entities through DOE grants. Capital Assets do not include intangible assets, such as the knowledge resulting from research and development and education and training. See PHYSICAL ASSET.

**Change Control Board (CCB).** A multi-discipline functional body of representatives designated and chartered by the appropriate management level to ensure the proper definition, coordination, evaluation, and disposition of all proposed changes.

**Change in Scope.** A change in objectives, work plan, costs, or schedule that results in a material difference from the terms of an approval-to-proceed previously granted by higher authority. Under certain conditions, stated in the approval instrument, change in resources application may constitute a change in scope. Under contractual agreement, COs are the only Government personnel authorized to issue a change order of contract modification to a contractor/performer, in order to implement a change of scope. A change in scope may also affect the availability of current year funds until the proper congressional notification procedures have been executed.

**Change Proposal.** The instrument/document prepared to provide a complete description of a proposed change and its resulting impact on a project objectives.

**Chart of Accounts.** Any numbering system used to monitor project costs by category (e.g., labor, supplies, materials). The project chart of accounts is usually based upon the corporate chart of accounts of the primary performing organization, and is directly linked to the project's work breakdown structure. See also CODE OF ACCOUNTS.

**Code of Accounts.** Any numbering system used to uniquely identify each element of the work breakdown structure. See also CHART OF ACCOUNTS.

**Commissioning.** Commissioning is a systematic process for achieving, verifying, and documenting that the performance of the facility and its various systems meet the design intent and the functional and operational needs of the owners, users, and occupants. The process extends through all phases of a project, from conceptualization to occupancy and operation, with numerous checks at each stage of the process to ensure that established procedures are followed.

**Commitment.** An administrative reservation of funds, prior to creation of an obligation. A commitment is based upon a valid request for procurement that authorizes the creation of an obligation without further recourse to the official responsible for assuring the availability of funds. (Note: This definition concerns commitments in the accounting sense and therefore differs from loan guarantee commitments.)

**Communications Planning.** Determining the information and communications needs of personnel, support personnel, management, and project stakeholders.

**Conceptual Design.** Conceptual design encompasses those efforts to: (a) develop a project scope that will satisfy program needs; (b) assure project feasibility and attainable performance levels; (c) develop reliable cost estimates and realistic schedules in order to provide a complete description of the project for Congressional consideration; and (d)

develop project criteria and design parameters for all engineering disciplines, identification of applicable codes and standards, quality assurance requirements, environmental studies, materials of construction, space allowances, energy conservation features, health safety, safeguards, and security requirements, and any other features or requirements necessary to describe the project. Conceptual design occurs between Critical Decision-0 and -1.

**Conceptual Design Report (CDR).** The CDR documents the outcome of the conceptual design phase and forms the basis for a preliminary ROM baseline.

**Conditional or Provisional Acceptance.** The acceptance of a unit or facility with a documented listing of the specific testing to be accomplished or work remaining including the furnishing of any outstanding submittals of technical and record data, to be completed by the construction contractor, and on or by what date the actions are scheduled to be complete.

**Configuration.** The functional and/or physical characteristics of hardware, firmware and/or software, or any of their discrete portions, as set forth in technical documentation and achieved in a product. Configuration items may vary widely in complexity, size, and type, from a facility, electronic, or control system to a test meter or process vessel. Any item required for logistic support and designated for separate procurement is a configuration item.

**Configuration Acceptance.** The systematic evaluation, coordination, approval (or disapproval), documentation, implementation, and audit of all approved changes in the configuration of a product after formal establishment of its configuration identification.

**Configuration Management.** The technical and administrative direction and surveillance actions taken to identify and document the functional and physical characteristics of a configuration item; to control changes to a configuration item and its characteristics; and to record and report change processing and implementation status.

**Construction.** Any combination of engineering, procurement, erection, installation, assembly, demolition, or fabrication activities involved in creating a new facility, or to alter, add to, rehabilitate, dismantle, or remove an existing facility. It also includes the alteration and repair (including dredging, excavating, and painting) of buildings, structures, or other real property, as well as any construction, demolition, and excavation activities conducted as part of environmental restoration or remediation efforts. Construction occurs between Critical Decision-3 and -4. Construction does not involve the manufacture, production, finishing, construction, alteration, repair, processing, or assembling of items categorized as personal property

**Construction/As-built Services.** Those activities required to assure that the project is constructed in accordance with the plans and specifications (e.g., construction inspection), and that the quality of materials and workmanship is consistent with the requirements of the project (e.g., materials testing).



**Construction Completion Date.** The date on which work normally performed by construction forces (including installation of equipment by operating contractors or others) is accepted by the Government. This includes the completion of all building items, the erection and/or installation of mechanical units and/or processing equipment, and the installation of all furnishings as required to make a fully functioning building, facility, or process. Correction of minor deficiencies and exceptions may be accomplished after the recorded date.

**Construction Management.** Services that encompass a wide range of professional services relating to the management of a project during the pre-design, design, and/or construction phases. The types of services provided include development of project strategy, design review relating to cost and time consequences, value management, budgeting, cost estimating, scheduling, monitoring of cost and schedule trends, procurement, observation to assure that workmanship and materials comply with plans and specifications, contract administration, labor relations, construction methodology and coordination, and other management efforts related to the acquisition of construction.

**Contingency.** Contingency is that budget held by DOE that is not put on contract.

**Contract.** A contract is a mutually binding agreement that obligates the seller to provide the specified product and obligates the buyer to pay for it. It includes all types of commitments that obligate the Government to an expenditure of funds and which, except as otherwise authorized, are in writing. **Contract Advance Funding.** Obligations to a contract or project, to cover future work or materials not yet ordered. The value of advanced funding is the difference between uncosted obligation and unfilled orders outstanding.

**Contract Closeout.** Completion and settlement of the contract including resolution of all outstanding items.

**Contracting Officer's Technical Representative (COTR).** The individual in DOE who is assigned responsibility for overall technical monitoring of a contract and identified as such in the contract. The Contracting Officer's Technical Representative monitors the technical work performed under the contract, evaluates the contractor's performance, provides the contractor and the CO with technical guidance, reports on contract status to DOE program and project management, and recommends corrective action when necessary. Each project IPT will include a CO or Contracting Officer's Technical Representative.

**Control (Cost) Account.** A management control point at which budgets (resource plans) and actual costs are accumulated and compared to earned value for management control purposes. A control account is a natural management point for planning and control since it represents the work assigned to one responsible organizational element on one work breakdown structure element and is the lowest level where all three PMB elements are accumulated.

**Corrective Action.** Changes made to bring expected future performance of the project into line with the plan.

**Cost Budgeting.** Allocating the cost estimates to individual project components.

**Cost Control.** Controlling changes to the project budget and forecast to completion.

**Cost Estimate.** A documented statement of costs estimated to be incurred to complete the project or a defined portion of a project. Cost estimates provide input to original baselines and changes to baselines, against which cost comparisons are made throughout the life of a project.

**Cost Estimating.** Estimating the cost of the resources needed to complete project activities.

**Cost Plus Award Fee Contract.**

**Cost Plus Fixed Fee (CPFF) Contract.** A type of contract where the buyer reimburses the seller for the seller's allowable costs (allowable costs are defined by the contract) plus a fixed amount of profit (fee).

**Cost Plus Incentive Fee (CPIF) Contract.** A type of contract where the buyer reimburses the seller for the seller's allowable costs (allowable costs are defined by the contract), plus a fee calculated on the basis of defined performance criteria.

**Cost Variance.** It is the algebraic difference between earned value and actual cost ( $\text{Cost Variance} = \text{Earned Value} - \text{Actual Cost}$ .) A positive value indicated a favorable position and a negative value indicates an unfavorable condition.

**Costs to Date.** Costs incurred to date by the contractor and reported to DOE, which are recorded as accrued costs. They represent all charges incurred for goods and services received and other assets required, regardless of whether payment for the charges has been made. This includes all completed work and work in process chargeable to the contract. Accrued costs include invoices for: (1) completed work to which the prime contractor has acquired title; (2) materials delivered to which the prime contractor has acquired title; (3) services rendered; (4) costs billed under cost reimbursement, or time and material subcontracts for work to which the prime contractor has acquired title; (5) progress payments to subcontractors that have been paid or approved for current payment in the ordinary course of business (as specified in the prime contract); and (6) fee profit allocable to the contract.

**Critical Activity.** Any activity on a critical path or with a zero or negative float value. Most commonly determined by using the critical path method. Although some activities are "critical" in the dictionary sense without being on the critical path, this meaning is seldom used in the project context.

**Critical Decision (CD).** A formal determination, made by the AE and/or designated official (Mission Need Statement) at a specific point in a project life cycle that allows the project to proceed. Critical Decisions occur in the course of a project. For example: prior to commencement of conceptual design, commencement of execution and prior to turnover.

**Critical Path.** In a project network diagram, the series of logically linked activities that determine the earliest completion date for the project. The critical path may change from time to time as activities are completed ahead of or behind schedule. Although normally calculated for the entire project, the critical path can also be determined for a milestone or subproject. The critical path is usually defined as those activities with float less than or equal to a specified value, often zero.

**Critical Path Method.** A network analysis technique used to predict project duration by analyzing which sequence of activities (which path) has the least amount of scheduling flexibility (the least amount of float). Early dates are calculated by means of a forward pass using a specified start date. Late dates are calculated by means of a backward pass starting from a specified completion date to result in zero total float for each activity.

**Deactivation.** The process of placing a facility in a stable and known condition including the removal of readily removable hazardous and radioactive materials to ensure adequate protection of the worker, public health and safety, and the environment, thereby limiting the long-term cost of surveillance and maintenance. Actions include the removal of fuel, draining and/or de-energizing nonessential systems, removal of stored radioactive and hazardous materials, and related actions. Deactivation can also include disposition of wastes generated during deactivation efforts. Deactivation does not include all decontamination necessary for the dismantlement and demolition phase of decommissioning, e.g., removal of contamination remaining in the fixed structures and equipment after deactivation.

**Decommissioning.** The process of closing and securing a nuclear facility or nuclear materials storage facility so as to provide adequate protection from radiation exposure and to isolate radioactive contamination from the human environment.

**Decontamination.** The removal of a chemical, biological, or radiological contaminant from, or neutralizing its potential effect on, a person, object or environment by washing, chemical action, mechanical cleaning, or other techniques. Deactivation may also include treatment and disposal of wastes generated during decontamination efforts.

**Definition.** A term coined to define the time period in a project's life cycle between Critical Decision-0 and -1, i.e., all pre-acquisition planning/pre-acquisition design and conceptual design activities and actions.

**Deviation.** A project deviation occurs when the current estimates of cost, schedule, or performance are not within the threshold value established in the APB. See BREACH.

**Directed Change.** A change imposed on a project(s), with direction to implement, that affects one or more of the project's (projects') baselines. Example of directed changes include, but are not limited to: (a) Changes to approved budgets, or funding, and (b) changes resulting from DOE policy directives and regulatory or statutory requirements.

**Disposition.** A general term for those activities that follow completion of program mission, including, but not limited to, stabilization, deactivation, decontamination, decommissioning, dismantlement, and/or reuse of physical assets. It is used as a general term for those project types that follow mission completed.

**Duration.** The number of work periods (not including holidays or other non-working periods) required to complete an activity or other project element. Usually expressed as workdays or workweeks. Sometimes incorrectly equated with elapsed time.

**Earned Value (EV).** (1) A method for measuring project performance. It compares the value of work performed (Budgeted Cost of Work Performed) with the value of work scheduled (Budgeted Cost of Work Scheduled) and the cost of performing the work (Actual Cost of Work Performed) for the reporting period and/or cumulative to date. See also ACTUAL COST OF WORK PERFORMED, BUDGETED COST OF WORK SCHEDULED, BUDGETED COST FOR WORK PERFORMED, COST VARIANCE, COST PERFORMANCE INDEX, SCHEDULE VARIANCE, AND SCHEDULE PERFORMANCE INDEX. (2) The budgeted cost of work performed for an activity or group of activities.

**End Item.** The product/deliverable of a specific type of procurement action. To qualify as an end item, the procurement action product or deliverable is to be a stand-alone unit that meets all requirements and performs its intended function/mission without any additional components, infrastructure support or supporting assemblies. For example, a fire truck, a mobile crane, an earth mover.

**Engineering Change.** An approved change to controlled identification documentation. An engineering change proposal is used to recommend an engineering change. There are typically two classes of engineering changes: (a) Class 1: Changes of configuration, which affects Departmental interest and requires approval from the appropriate approval authority or designated representative. Class 1 engineering changes are those which affect: (1) technical baseline requirements, and/or (2) non-technical contractual provisions such as fee, incentives, cost, schedule, guarantees, or deliveries. (b) Class 2: Changes to a product that do not affect any of the Class 1 engineering change requirements. The Department's approval prior to implementation is not required, although such changes are subject to post-facto classification review by the project office. Other distinctions may exist and are documented in the PEP.

**Estimate At Completion (EAC).** The current estimated cost for program authorized work. (EIA-748)

**Estimate To Complete (ETC).** Estimate of costs to complete all work from a point in time to the end of the project or program.

**Estimated Cost.** An anticipated cost for applied work scope.

EIR

**Executability Review.** Executability Reviews are organized and conducted for all projects. For Major Systems, the executability review is organized and conducted by OEMC. For non-Major Systems, the review is to be organized and conducted by the program, using independent reviewers who are not assigned or working on the project at the contractor or field level. Executability reviews assess the project and validate the plans as executable within the APB. The review will examine the work breakdown structure, cost, schedule, design, management, control, integration and other areas to ascertain the maturity of the project planning and organization and the probability of success. The results of the review, along with recommendations and remedial actions are submitted to OEMC for review and presented to the AE and ESAAB prior to Critical Decision-3. The data from the executability review will be considered by the SAE/AE in making Critical Decision-3.

**Execution.** A term coined to define the time period in a project's life cycle between Critical Decision-1 and -4, i.e., all preliminary design, final design, and construction/remediated activities and actions.

**Facilities.** Buildings and other structures; their functional systems and equipment, including site development features such as landscaping, roads, walks, and parking areas; outside lighting and communications systems; central utility plants; utilities supply and distribution systems; and other physical plant features.

**Fair Value Cost Estimates.** Used to check the cost of proposed designs or provide benchmarks for scope to be outsourced to others.

**Fast Tracking.** Compressing the project schedule by overlapping activities that would normally be done in sequence, such as design and construction. Increasingly overlapping activities increase the risk of accomplishing those activities on time and at cost.

**Final Design.** Completion of the design effort and production of all the approved design documentation necessary to permit procurement. Construction, testing, checkout, and turnover to proceed. Final design occurs between Critical Decision-2 and -3.

**Fixed Price Contracts.** Fixed price contracts provide for a firm price or, under appropriate circumstances, may provide for an adjustable price for the supplies or services that are being procured. In providing for an adjustable price, the contract may fix a ceiling price, target price (including target cost), or minimum price. Unless otherwise provided in the contract, any such ceiling, target, or minimum price is subject to adjustment only if required by the

operation of any contract clause that provides for equitable adjustment, escalation, or other revision of the contract price upon the occurrence of an event or a contingency.

**Fixed Price Incentive Fee Contract.** A type of contract where the buyer pays the seller a set amount (as defined by the contract), and the seller can earn an additional amount if it meets or exceeds defined performance criteria.

**Functional Organization.** An organization structure in which staff are grouped hierarchically by specialty (e.g., production, marketing, engineering, and accounting at the top level; with engineering, further divided into mechanical, electrical, and others).

**General Plant Projects (GPP).** Congress has recognized DOE's need to provide for miscellaneous construction items that are required during the fiscal year and which cannot be specifically identified beforehand. Congress provides, annually, an amount for these purposes under the title of General Plant Projects.

**Independent Cost Estimate (ICE).** A "bottoms-up" documented, independent cost estimate that has the express purpose of serving as an analytical tool to validate, cross-check, or analyze cost estimates developed by project proponents.

**Independent Cost Review (ICR).** An essential project management tool used to analyze and validate an estimate of project costs. An independent cost review is typically conducted on all projects at the point of baseline approval. Such reviews may be required by Congress, DOE management, Headquarters program offices, or field project management staff. The requiring office or agency will provide specific requirements for such reviews. An ICR may be performed by an independent internal or external organization.

**Independent Evaluation (Review).** An evaluation, made outside the normal advocacy chain, of a project's status or condition. In the project management system, it is made by the Office of Program/Project Management in its role of independent monitoring. It will consist of independent evaluation of all pertinent factors in order to provide a condition rating or detailed analysis of the project or system situation. Independent evaluations will typically be provided in conjunction with Headquarters reporting to senior DOE management; advisory board decision reviews; or other purposes associated with the program planning and budgeting system, acquisition, or other DOE management control and direction processes. These independent evaluations are to be based on knowledge of the project and related institutional matters. The Office of Program/Project Management will obtain this knowledge through reports from the project management and program organizations; conduct of field and Headquarters reviews with the program organization, the Departmental managing office, and principal contractors; and direct communication and discussion of project matters with the DOE managing and program offices.

**Independent Review (IR).** IRs are critical in assessing the performance and health of projects, providing the opportunity to identify potential problems and risks, and formulate

plans to correct problems. An IR is conducted by a non-proponent of the project. The IR may be a science-based or engineering-oriented peer review, a review of the project management structure and interrelationships between key organizational components, a review targeted to a specific issue such as cost or budget, a review covering safety, or a combination thereof. Independent reviews may be combined for efficiency, as appropriate.

**Initial Operating Capability (IOC).** The point at which a project is sufficiently complete and its performance has been demonstrated and it has met the technical threshold criteria in the APB. It is not reaching full, steady-state operations.

**Initiation.** A term coined to define the time period in a project's life cycle up to and including Critical Decision-0, i.e., activities and actions prior to pre-acquisition planning/preconceptual design.

**Integrated Project Team (IPT).** An IPT is a cross-functional group of individuals organized for the specific purpose of delivering a project to an external or internal customer. Team members are representative of all competencies that influence the project's overall performance, safety/quality, scope, schedule, or cost. The IPT should be committed to a common purpose and approach for which they hold themselves mutually accountable. Team members are trained by their home departments/organizations to execute standard processes and exercise technical and/or business judgment within established policies in support of the assigned project. Members of an IPT represent technical, manufacturing, business, contracting and support functions and organizations that are critical to developing, procuring and supporting the product. Depending upon the project needs, the typical IPT membership could include legal, quality, safety, environmental, and technical personnel. In all cases, however, the IPT should include a representative from the contracting function; this may be a CO or the Contracting Officer's Technical Representative. In certain cases, the PM may serve as the Contracting Officer's Technical Representative. All IPT actions and activities are performed under the direction of the PM. If possible, IPT members may be assigned for the length of time required to complete their IPT assignments. Therefore, depending upon the relative impact of a team competency, team membership may be either full-time or part-time. IPTs are the means through which the acquisition process is implemented. The IPT is the overall project support team having responsibility for pre-project, project development, design/engineering, and construction/remediation activities as appropriate. As a project progresses from Initiation to Transition/Closeout completion, the IPT membership may change in both members and capabilities to remain responsive to project needs and requirements. This flexibility allows the PM to adapt the IPT to meet constantly changing project needs.

**Integrated Safety Management (ISM).** The application of the integrated safety management system (ISMS) to a project or activity. The fundamental premise of ISM is that accidents are preventable through early and close attention to safety, design, and operation,

and with substantial stakeholder involvement in teams that plan and execute the project, based on appropriate standards.

**Integrated Safety Management System (ISMS).** An overall management system designed to ensure that environmental protection, worker and public safety is appropriately addressed in the planning, design, and performance of any task.

**Internal Replanning.** Replanning actions for remaining work scope. A normal program control process accomplished within the scope, schedule, and cost objectives of the program.

**Key Cost Parameters (KCP).** Identify the total cost of the project (TPC), and in general include direct costs such as research and development, test, construction, remediation, procurement, fabrication, services, transition, and startup. Costs of quality, environment, safety, occupational health as well as the cost of acquisition items procured with operations and maintenance funds and also included, as well as indirect costs not directly attributable to the project but resulting from the project such as infrastructure costs. At a minimum, the TPC and the TEC is a KCP and a KPP, respectively.

**Key Performance Parameters (KPP).** A vital characteristic of a project or facility mission. A characteristic, function, requirement, or design basis, that if changed, would have a major impact on the facility or system performance, scope, schedule, cost and/or risk, or the ability of an interfacing project to meet its mission requirements. Thus, a KPP may be a performance, design or interface requirement. Parameters that are appropriate for KPPs are those that express performance in terms of accuracy, capacity, throughput, quantity, processing rate, purity, or others that define how well a system, facility or other project will perform.

**Key Schedule Parameters (KSP).** Decision points, major milestones, deliverables, initial operation and other critical system events. Mandatory schedule parameters include all phases of the project, major decision points, and initial operation. Schedule parameters are established through an interactive process that proceeds integrally with the technical and cost processes. Critical path activities, events, milestones and resources are developed using a disciplined approach and are properly integrated with all other appropriate events.

**Lead Program Secretarial Officer (LPSO).** The individual assigned line management responsibility and accountability for Headquarters and field operations and to which one or more multi-program field offices directly report.

**Level of Effort (LOE).** Effort of a general or supportive nature usually without a deliverable end product. An activity (e.g., vendor or customer liaison) that does not readily lend itself to measurement of discrete accomplishment. It is generally characterized by a uniform rate of activity over a specific period of time. Examples are supervision, program administration, and contract administration. Level of Effort tasks receive budgeted cost for work performed, based upon the passage of time, not measured output.



**Life Cycle Cost (LCC).** The sum total of the direct, indirect, recurring, nonrecurring, and other related costs incurred or estimated to be incurred in the design, development, production, operation, maintenance, support, and final disposition of a major system over its anticipated useful life span. Where system or project planning anticipates use of existing sites or facilities, restoration, and refurbishment costs should be included.

**Life Cycle Costing.** The concept of including acquisition, operating, and disposal costs when evaluating various alternatives.

**Line-Item Projects.** Projects that are specifically reviewed and approved by Congress. Projects with a total project cost greater than \$5 million are categorized as line item projects.

**Line Manager.** (1) The manager of any group that actually makes a product or performs a service. (2) A functional manager.

**Long-Lead Procurement Items.** Those items of equipment and/or construction materials that require an order date prior to the estimated physical construction start to assure availability at the time needed to avoid delaying the construction performance.

**Major System (MS) Projects.** Any project or system of projects having a TPC of \$750M or greater, or any other project so designated by the Deputy Secretary. Projects may be classified as MS either solely by the Deputy Secretary or by the Deputy Secretary in response to recommendations from the appropriate Under Secretary. OECM maintains and periodically publishes a list of MS projects.

**Management Reserve** An amount of the total allocated budget withheld for management control purposes, rather than assigned for the accomplishment of a specific task or set of tasks. It is not a part of the Performance Measurement Baseline.

**Master Schedule.** A summary-level schedule that identifies the major activities and key milestones. See also MILESTONE SCHEDULE.

**Matrix Organization.** Any organizational structure which defines the manner in which project and functional organizations exist and their reporting relationships.

**Milestone Schedule.** A summary-level schedule that identifies the major milestones. See also MASTER SCHEDULE.

**Milestone.** A schedule event marking the due date for accomplishment of a specified effort (work scope) or objective. A milestone may mark the start, an interim step, or the end of one or more activities.

**Mission Need.** A required capability within DOE's overall purpose, including scope, cost and schedule considerations. When the mission analysis, or studies directed by appropriate executive or legislative authority, identify a deficiency in existing capabilities or an

opportunity, this will be set forth as justification for purposes of system acquisition approvals, planning, programming, and budget formulation.

**Mitigation.** Taking steps to lessen risk by lowering the probability of a risk event's occurrence or reducing its effect should it occur.

**Monte Carlo Analysis.** A schedule risk assessment technique that performs a project simulation many times in order to calculate a distribution of likely results.

**Network Schedule.** A schedule format in which the activities and milestones are represented along with the interdependencies between activities. It expresses the logic (how the program will be accomplished) and the timeframes (when). Network schedules are the basis for critical path analysis, a method for identification and assessment of schedule priorities and impacts.

**Objective Value.** That dollar value desired by the user and which the program manager is contracting for or otherwise attempting to obtain.

**Organizational Breakdown Structure (OBS).** A depiction of the project organization arranged to indicate the line reporting relationships within the project context.

**Organizational Planning.** Identifying, documenting, and assigning project roles, responsibilities, and reporting relationships.

**Organization Structure.** The hierarchical arrangement for the management organization for a program, graphically depicting the reporting relationships. The organizational structure will be by work team, function, or any organization units that are used by the company.

**Other Project Costs (OPC).** Costs related to engineering, development, startup, and operations. These activities/costs and allowances are essential for project execution, but are not considered part of the normal capital system/facility acquisition cost. They are operating/expense funded.

**Non-Major System Projects.** Any project or system of projects having a TPC between \$5M and \$750M, or any other project so designated by the Deputy Secretary.

**Parameter.** A determining factor or characteristic. Usually related to performance in developing a system.

**Parametric Estimating.** An estimating technique that uses a statistical relationship between historical data and other variables (e.g., square footage in construction, lines of code in software development) to calculate an estimate.

**Pareto Diagram.** A histogram, ordered by frequency of occurrence, that shows how many results were generated by each identified cause.

**Percent Complete (PC).** An estimate, expressed as a percent, of the amount of work that has been completed on an activity or group of activities.

**Physical Construction Start.** For purposes of reporting construction progress, the date on which work at the site physically starts, including work on site preparation, temporary construction, and any earth moving. The start date of construction of permanent facilities should also be indicated.

**Planned Finish Date .** See SCHEDULED FINISH DATE.

**Planned Start Date .** See SCHEDULED START DATE.

**Planning Package.** A logical aggregate of work, usually future efforts that can be identified and budgeted, but which is not yet planned in detail at the work package or task level.

**Preliminary Design.** Continues the design effort utilizing the conceptual design and the project design criteria as a basis for project development. Preliminary design develops topographical and subsurface data and determines the requirements and criteria that will govern the definitive design. Tasks include preparation of preliminary planning and engineering studies, preliminary drawings and outline specifications, life cycle cost analysis, preliminary cost estimates, and scheduling for project completion. Preliminary design provides identification of long-lead procurement items and analysis of risks associated with continued project development. Preliminary design occurs between Critical Decision-1 and -2.

**Program.** An organized set of activities directed toward a common purpose or goal undertaken or proposed in support of an assigned mission area. A program is characterized by a strategy for accomplishing a definite objective(s), which identifies the means of accomplishment, particularly in quantitative terms, with respect to manpower, materials, and facilities requirements. Programs usually include an element of ongoing activity and are typically made up of technology based activities, projects, and supporting operations. See ACQUISITION PROGRAM/PROJECT.

**Program Evaluation.** A determination of program condition based on a review of cost, scope, schedule, technical status, and performance in relation to mission area assignments, program objectives, approved strategy, and milestones. Evaluations made by the responsible line program organization and outside the advocacy chain by the Office of Program/Project Management. In all cases, program evaluations are to be based on knowledge of the actual program status, performance, problems, and significant development in approval; review; and environment, safety, health, and quality assurance processes.

**Program Management.** Management responsibility and authority for specific programs will normally be delegated by the cognizant Program Secretarial Officer. The Headquarters' functions of program management includes planning and developing the overall program;

establishing broad priorities; providing policy and broad program direction; preparing and defending the budget; establishing the technical performance, scope, schedule, and cost requirements for projects; controlling DOE Headquarters-level milestones; integrating all components of the program; providing public and private sector policy liaison; expediting Headquarters interface activities and follow-up actions; and retaining overall accountability for program success. The field function includes implementing these program activities, controlling field-level milestones, and providing major support to the Headquarters programming budgeting and processes.

**Program Manager.** An official who has been assigned responsibility for accomplishing a specifically designated unit of work effort, or group of closely related efforts, established to achieve stated or designated objectives, defined tasks, or other units of related effort on a schedule, funded as part of the project. The Program Manager is responsible for the planning, controlling, and reporting of the project, and for the management of a specific function or functions, budget formulation, and execution of the approved budget. The Program Manager receives an approved funding program from the Office of the Controller identifying program dollars available to accomplish the assigned function.

**Program Objectives.** A statement or set of statements defining the purposes and goals to be achieved during performance of a program to fulfill a DOE mission including the technical capabilities, cost, and schedule goals.

**Program Office.** The Headquarters organizational element responsible for managing a program.

**Program Secretarial Officer (PSO).** A senior outlay program official which includes the Senior Outlay program official which includes the Assistant Secretaries, or Office Directors at the Assistant Secretary level, and/or the Assistant Administrators for NNSA.

**Project.** In general, a unique effort that supports a program mission, having defined start and end points, undertaken to create a product, facility, or system, and containing interdependent activities planned to meet a common objective or mission. A project is a basic building block in relation to a program that is individually planned, approved, and managed. A project is not constrained to any specific element of the budget structure (e.g., operating expense or plant and capital equipment). Construction, if required, is part of the total project. Authorized, and at least partially appropriated, projects will be divided into two categories: major system projects and other projects. Projects include planning and execution of construction, renovation, modification, environmental restoration, decontamination and decommissioning efforts, and large capital equipment or technology development activities. Tasks that do not include the above elements, such as basic research, grants, ordinary repairs, maintenance of facilities, and operations are not considered projects. See ACQUISITION PROGRAM/PROJECT.

**Project Charter.** A document issued by senior management that provides the Program Manager with the authority to apply organizational resources to project activities.

**Project Data Sheet (PDS).** A generic term defining the document that contains summary project data and the justification required to include the entire project effort as a part of the Departmental budget. PDSs are submitted to request PED funds, and construction funds. Specific instructions on the format and content of PDSs are contained in the annual budget call, and DOE O 5100.3, Field Budget Process.

**Project Design Criteria.** Those technical data and other project information identified during the project initiation and definition (conceptual design, and/or preliminary design phases). They define the project scope, construction features and requirements, and design parameters; applicable design codes, standards, and regulations; applicable health, safety, fire protection, safeguards, security, energy conservation, and quality assurance requirements; and other requirements. The project design criteria are normally consolidated into a document which provides the technical base for any further design performed after the criteria are developed.

**Project Engineering and Design (PED).** A design fund established for program/project use on preliminary design and final baseline development, and/or a statement of work/ request for proposal for a design/build contract. PED funding begins with submission for funds during the pre-project phase and continues through final design completion. PED funds are not to be used for implementation, development, construction, long-lead procurements or major items of equipment. PED fund requirements are developed from historical data or parametric estimates. The objectives for the use of PED funds are to improve the probability of an accurate Performance Baseline for the project; establish the APB after the Preliminary Design is completed; and improve the DOE's Planning, Programming & Budgeting process for the acquisition of capital capabilities. Completed conceptual design is a prerequisite for allocation of PED funds.

**Project Execution Plan (PEP).** The PEP is the primary agreement on project planning and objectives between the Headquarters Program Office and the Field, which establishes roles and responsibilities and defines how the project will be executed. The PEP, once approved, becomes a significant tool for the PM through the life of the project. The Headquarters or Field program manager and/or the Federal project manager initiates a PEP. Development of the preliminary PEP can be started by the prime contractor or M&O/M&I at the same time as development of the AS or shortly after. The two plans should be synchronized. If the approved AS indicates that the M&O/M&I contractor has a role in the acquisition of the project as prime contractor/integrator, the M&O/M&I contractor may participate with DOE in development of the final PEP.

**Project Interface.** A point forming a common boundary between a project and any other project or non-project entity, activity, or service. An interface provides a means or a point of

interaction/communication between a project's systems, disciplines and organizations, and those of all other systems, disciplines, and organizations.

**Project Life Cycle.** A collection of generally sequential project phases whose name and number are determined by the control needs of the organization or organizations involved in the project.

**Project Management Body of Knowledge (PMBOK®).** An inclusive term that describes the sum of knowledge within the profession of project management. As with other professions such as law, medicine, and accounting, the body of knowledge rests with the practitioners and academics who apply and advance it. The PMBOK® includes proven, traditional practices that are widely applied as well as innovative, and advanced practices that have seen more limited use.

**Project Management.** A management approach in which authority and responsibility for execution are vested in a single individual, at a level below the general manager, to provide focus on the planning, organizing, directing, and controlling of all activities within the project. PM within DOE requires the skillful application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project. In general terms, project management functions include assisting the program manager in preparing Headquarters documents and establishing key milestones and overall schedules. Other activities include developing and maintaining the project management plan; managing project resources; establishing and implementing management systems, including performance measurement systems; and approving and implementing changes to project baselines.

**Project Manager (PM).** An official who has been assigned responsibility for accomplishing a specifically designated unit of work effort, or group of closely related efforts, established to achieve stated or designated objectives, defined tasks, or other units of related effort on a schedule, funded as part of the project. The PM is responsible for the planning, controlling, and reporting of the project.

**Projectized Organization.** Any organizational structure in which the PM has full authority to assign priorities and direct the work of individuals assigned to the project.

**Quality Assurance (QA).** (1) The process of evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards. (2) The organizational unit that is assigned responsibility for QA. All the planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily in service. QA includes quality control, which comprises all those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements.

**Quality Control (QC).** (1) The process of monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance. (2) The organizational unit that is assigned responsibility for quality control.

**Quality Planning.** Identifying which quality standards are relevant to the project and determining how to satisfy them.

**Real Property.** Land and/or improvements including interests therein, except public domain land.

**Remaining Duration.** The time needed to complete an activity.

**Resource Leveling.** Any form of network analysis in which scheduling decisions (start and finish dates) are driven by resource management concerns (e.g., limited resource availability or difficult-to-manage changes in resource levels).

**Resource-Limited Schedule.** A project schedule whose start and finish dates reflect expected resource availability. The final project schedule should always be resource-limited.

**Responsibility Assignment Matrix (RAM).** A structure that relates the project organization structure to the work breakdown structure to help ensure that each element of the project's scope of work is assigned to a responsible individual.

**Reviews.** A determination of project or system acquisition conditions based on a review of project scope, cost, schedule, technical status, and performance in relation to program objectives, approved requirements, and baseline project plans. These reviews provide critical insight into the plans, design, cost, schedule, organization, and other aspects of the project. They provide the project and senior management with information on which to base critical and non-critical decisions and to make changes which will increase the project's probability of success. Reviews are authorized by the SAE, AE, PAS responsible line managers, operations/field office manager or Program Managers. In all cases, reviews are based on knowledge of the actual project status, performance, problems, and significant development in both the actual execution activities as well as required institutional approval, licensing, review, and environmental processes. The nature of a review requires a critical approach to reviewing and analyzing the project. This generally requires the reviewers to be outside the project, program, and organization in order to avoid inadvertently biasing the analysis. Examples of review include independent reviews, executability reviews, and independent baseline reviews.

**Risk.** An event that might happen to the detriment of a program, project or activity. It is described by the probability that the event will occur and the consequence of the extent of loss from the occurrence. The opposite of a "risk" is an "opportunity" which also has estimated impact (savings) and probability (likelihood of occurrence).

**Risk Event.** A discrete occurrence that may affect the project for better or worse.

**Risk Identification.** Determining which risk events are likely to affect the project.

**Risk Management.** The act or practice of controlling risk. An organized process that reduces the risk of an activity or project which will maximize the potential for success of the activity.

**Risk Mitigation.** A risk handling strategy that decreases risk either by lowering the consequence of a risk event, or by a combination of reducing the probability that a risk event will occur and reducing the consequence of that event.)

**Risk Quantification.** Evaluating the probability of risk event occurrence and effect.

**Risk Response Control.** Responding to changes in risk over the course of the project.

**Risk Response Development.** Defining enhancement steps for opportunities and mitigation steps for threats.

**S-Curve.** Graphic display of cumulative costs, labor hours, or other quantities plotted against time. The name derives from the S-like shape of the curve (flatter at the beginning and end, steeper in the middle) produced on a project that starts slowly, accelerates, and then tails off.

**Schedule.** A plan that defines when specified work is to be done to accomplish program objectives on time.

**Schedule Control.** Controlling changes to the project schedule and preparing workaround plans to mitigate the impact of adverse results/delays by others.

**Schedule Variance (SV).** A metric for the schedule performance on a program. It is the algebraic difference between earned value and the budget (Schedule Variance = Earned Value - Budget). A positive value is a favorable condition while a negative value is unfavorable. The SV is calculated in dollars or work units and is intended to compliment network analysis, not supercede or replace it.

**Scheduled Finish Date.** The date shown on the project master schedule by which all project activities (including tasks, turnover, and appropriate actions) are to be complete.

**Scheduled Start Date.** The date shown on the project master schedule by which all project activities (including task and actions) are to be started.

**Site.** A geographic entity comprising land, buildings, and other facilities required to perform program objectives. Generally a site has, organizationally, all the required facilities management functions. That is, it is not a satellite of some other site.



**Staff Acquisition.** Obtaining the human resources needed, assigned to, and working on the project.

**Statement of Work (SOW).** A narrative description of products or services to be supplied under contract.

**System.** A collection of interdependent equipment and procedures assembled and integrated to perform a well-defined purpose. It is an assembly of procedures, processes, methods, routines, or techniques united by some form of regulated interaction to form an organized whole.

**Tailoring.** A flexible approach to program oversight and review, where project criteria are applied based on the complexity, cost, and risks of each acquisition project or program. In a tailored approach, requirements are addressed to extent necessary and practical for managing each project. Tailoring may involve consolidation of decisions, documentation, and concurrency of processes. It requires all elements of the process to be addressed with adequate detail adapted to the complexity and risks associated with the project. Tailoring is to be applied to all programs and projects.

**Technical Baseline.** (a) Refers to those performance and design requirements, criteria, and characteristics derived from mission need that provides the basis for project direction and execution. (b) A configuration identification document or a set of such documents formally designated and approved by DOE at a specific time. (The time need not be the same for each document in the set.) The Conceptual Design Report (CDR) is the initial project technical baseline. The CDR, plus DOE approved changes, constitute the technical baseline.

**Technology.** A demonstration by experiment of the technical feasibility of alternative inventive concepts. This category may concern itself with processes, components, equipment, subsystems, or an initial system prototype, and may encompass: experimental exploitation and refinement of a known phenomenon; demonstration of the acceptability of the technical and operational characteristics of one or more specific concepts; and preliminary system studies responsive to a particular problem including system analysis, tradeoff, preliminary cost/benefit studies, and planning and programming studies.

**Threshold Value.** The value beyond which project performance is seriously degraded. The project becomes too costly, or the project is no longer timely. Also, the difference between the APB and the objective value. Threshold values are set individually for each project based on the characteristics of the project, e.g., maturity, risk, complexity.

**Total Estimated Costs (TEC).** The TEC of a project is the specific cost of the project, whether funded as an operating expense or construction. It includes the cost of land and land rights; engineering, design, and inspection costs; direct and indirect construction costs; and the cost of initial equipment necessary to place the plant or installation in operation, whether funded as an operating expense or construction. In recent years, Congress has authorized

amounts for projects exclusive of amounts for the construction planning and design. In these cases, the amount authorized is used as a base for TEC, even though it does not include planning and design costs. These costs are typically capitalized.

**Total Project Cost (TPC).** The TPC is synonymous with the cost of the APB. It consists of all the costs included in the Total Estimated Cost (TEC) of a project plus Other Project Costs (OPC) such as pre-construction costs, that include conceptual design and research and development, as well as costs associated with the pre-operational phase, such as training and startup. In budget terms, it is the sum of the technical baseline, schedule baseline, and cost baseline. It includes all research and development, operating, plant, and capital equipment costs specifically associated with project construction and may, when planned, go up to the point of routine operations.

**Undistributed Budget (UB).** Budget associated with specific work scope or contract changes that have not been assigned to a control account or summary-level planning package.

**User.** The entity that ultimately will operate or otherwise use the system being developed. When the project objective is to demonstrate to the private sector the utility or feasibility of a given system for commercial application, the identity of the ultimate user may not be known. In such case, only the most likely type of user (utility, constructor, energy supplier) may be identifiable.

**Validation.** The process of evaluating project planning, development, baselines and proposed funding prior to inclusion of new project or system acquisition in the DOE budget. It requires a review of project planning and conceptual development documentation, as well as discussion with the program or field element and principle contributing contractors to determine the source basis, procedures, and validity of proposed requirements, scope, cost schedule, funding, and so forth. Findings and recommendations resulting from the validation process will be provided for use in the annual budget formulation.

**Value Management (VM).** Value engineering is organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life cycle cost consistent with required performance, quality, reliability and safety.

**WBS/OBS Responsibility Matrix.** An integration of the WBS and the OBS to result in the assignment of one organizational element to each cost account.

**Work Breakdown Structure (WBS).** A product-oriented grouping of project elements that organizes and defines the total scope of the project. The WBS is a multi-level framework that organizes and graphically displays elements representing work to be accomplished in logical relationships. Each descending level represents an increasingly detailed definition of a project component. Project components may be products or services. It is the structure and

code that integrates and relates all project work (technical, schedule, and cost) and is used throughout the life cycle of a project to identify and track specific work scopes.

**Work Breakdown Structure Dictionary.** A listing of work breakdown structure elements with a short description of the work scope content in each element.

**Work Package.** A task or set of tasks performed within a control account.

**Workaround.** A response to a specific negative schedule event. Distinguished from a contingency plan in that a workaround is not planned in advance of the occurrence of the risk event.

# ACRONYMS

<b>AE</b>	Acquisition Executive
<b>ANSI</b>	American National Standards Institute
<b>APB</b>	Acquisition Performance Baseline
<b>AS</b>	Acquisition Strategy
<b>CBB</b>	Contract Budget Baseline
<b>CCB</b>	Change Control Board
<b>CD</b>	Critical Decision
<b>CDR</b>	Conceptual Design Report
<b>CERCLA</b>	Comprehensive Environmental Response, Compensation, and Liability Act
<b>CFO</b>	Chief Financial Officer
<b>CFR</b>	Code of Federal Regulations
<b>CO</b>	Contracting Officer
<b>COTS</b>	Commercial Off-the-Shelf
<b>CY</b>	Calendar Year
<b>DEAR</b>	Department of Energy Acquisition Regulation
<b>DoD</b>	U.S. Department of Defense
<b>DOE</b>	U.S. Department of Energy
<b>DOE-MR</b>	U.S. Department of Energy Management Reserve
<b>DP</b>	Defense Programs
<b>DQO</b>	Data Quality Objectives
<b>EE/CA</b>	Environmental Evaluation/Compliance Assessment
<b>EIA</b>	Electronic Institute of America
<b>EIR</b>	External Independent Review

<b>EIS</b>	Environmental Impact Statement
<b>EM</b>	Environmental Management
<b>EM-PDRI</b>	Environmental Management Project Definition Rating Index
<b>EPA</b>	U.S. Environmental Protection Agency
<b>ER</b>	Environmental Restoration
<b>ESAAB</b>	Energy Systems Acquisition Advisory Board
<b>ESH&amp;Q</b>	Environmental Safety, Health and Quality
<b>EVMS</b>	Earned Value Management System
<b>F&amp;Rs</b>	Functions and Requirements
<b>FAR</b>	Federal Acquisition Regulations
<b>FM</b>	DOE Office of Field Management
<b>EVMS</b>	Earned Value Management System
<b>FO</b>	Facilities and Operations
<b>FOM</b>	Field Office Manager
<b>FONSI</b>	Finding of No Significant Impact
<b>FY</b>	Fiscal Year
<b>FYP</b>	Future Year Program
<b>FYWP</b>	Fiscal Year Work Plan
<b>GPG</b>	Good Practice Guide
<b>GPRA</b>	Government Performance and Results Act
<b>ICE</b>	Independent Cost Estimate
<b>ICR</b>	Independent Cost Review
<b>IIR</b>	Internal Independent Review
<b>IMS</b>	Integrated Master Schedule
<b>IOC</b>	Initial Operating Capability
<b>IPABS</b>	Internal Planning, Accountability, and Budget System
<b>IPL</b>	Integrated Priority List
<b>IPR</b>	Independent Project Review

<b>IPS</b>	Integrated Project Schedule
<b>IPT</b>	Integrated Project Team
<b>IR</b>	Independent Review
<b>ISM</b>	Integration Safety Management
<b>ISMS</b>	Integrated Safety Management System
<b>ISO</b>	International Standards Organization
<b>IT</b>	Information Technology
<b>KCP</b>	Key Cost Parameter
<b>KPP</b>	Key Performance Parameter
<b>KSP</b>	Key Schedule Parameter
<b>LCAM</b>	Life Cycle Asset Management
<b>LLP</b>	Long-Lead Procurement
<b>LWA</b>	Limited Work Authorization
<b>M&amp;I</b>	Management and Integration
<b>M&amp;O</b>	Management and Operating
<b>MNS</b>	Mission Need Statement
<b>MS</b>	Major System Project
<b>MYSP</b>	Multi-year Strategic Plan
<b>NEPA</b>	National Environmental Policy Act
<b>NNSA</b>	National Nuclear Security Administration
<b>NPDES</b>	National Pollution Discharge Elimination System
<b>NQA-1</b>	National Quality Assurance Standard – 1
<b>NRC</b>	National Research Council
<b>OBS</b>	Organizational Breakdown Structure
<b>OECM</b>	Office of Engineering and Construction Management
<b>OMB</b>	Office of Management and Budget
<b>OMBE</b>	Office of Management, Budget and Evaluation
<b>OPC</b>	Other Project Costs

<b>ORR</b>	Operational Readiness Review
<b>OSHA</b>	Occupational Safety and Health Administration
<b>PARS</b>	Project Assessment and Reporting System
<b>PAS</b>	Program Assistant Secretaries
<b>PA/SI</b>	Preliminary Assessment/Site Investigation
<b>PBC</b>	Performance-Based Contract
<b>PDRI</b>	Project Definition Rating Index
<b>PDS</b>	Project Data Sheet
<b>PED</b>	Project Engineering and Design
<b>PEP</b>	Project Execution Plan
<b>PI</b>	Performance Indicator
<b>PM</b>	Project Manager
<b>PMB</b>	Performance Measurement Baseline
<b>PMBOK</b>	Project Management Book of Knowledge
<b>PMCDP</b>	Program/Project Management Career Development Program
<b>PMP</b>	Project Management Plan
<b>PMS</b>	Performance Measurement System
<b>PPBS</b>	Planning, Programming, Budgeting System
<b>QA</b>	Quality Assurance
<b>QAP</b>	Quality Assurance Plan
<b>QAPP</b>	Quality Assurance Program Plan
<b>QC</b>	Quality Control
<b>RA</b>	Readiness Assessment
<b>RCRA</b>	Resource Conservation and Recovery Act
<b>RD</b>	Requirements Document
<b>RFA</b>	RCRA Facility Assessment
<b>RFI</b>	RCRA Feasibility Investigation
<b>RFP</b>	Request for Proposal

<b>RFQ</b>	Request for Quotations
<b>ROM</b>	Rough Order of Magnitude
<b>SAE</b>	Secretarial Acquisition Executive
<b>S&amp;M</b>	Surveillance and Monitoring
<b>SB/PP</b>	Statement of Basis/Proposed Plan
<b>SI</b>	Site Investigation
<b>SOW</b>	Scope of Work
<b>SMS</b>	Strategic Management Plan
<b>T&amp;PRA</b>	Technical and Programmatic Risk Analysis
<b>TEC</b>	Total Estimated Cost (Capital)
<b>TPC</b>	Total Project Cost
<b>TPCE</b>	Total Project Cost Estimate
<b>TSCA</b>	Toxic Substances Control Act
<b>VAR</b>	Variance Analysis Report
<b>VM</b>	Value Management
<b>WA</b>	Work Authorization
<b>WBS</b>	Work Breakdown Structure



# Appendix B

## REFERENCES

The Directives system is the means by which DOE policies, requirements, and responsibilities are developed and communicated throughout the DOE complex.

Department of Energy Directives include policies, orders, notices, manuals, and guides, that are intended to direct, guide, inform, and instruct employees in the performance of their jobs, and enable them to work effectively within the Department and with agencies, contractors, and the public.

The current list of Directives is updated monthly and is available on the Internet in both .pdf and .wpd formats. The list can be accessed from the DOE web site at URL:  
<http://www.directives.doe.gov/serieslist.html>.

DOE Current Directives—new series, old series, headquarters, secretarial notices.

DOE Draft Directives—all DOE draft directives for review and comment.

DOE Archived Directives—DOE archived directives.

Supplemental Directives—Field directives.

DOE Directives Reference Tools—current checklist of DOE directives, DOE glossary, baseline directives by contract, crosswalk, and directives identified for sunset review.

Other Useful Information—Federal Register, DOE, CFRs, DOE forms, secretarial delegation of authority, etc.

## DEPARTMENT OF ENERGY

Atomic Energy Act of 1954, Pub. L. 54-703; 42 USC § 2011 et. seq., 08-30-54

DOE/EH-0173T, “Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance,” 01-91

DOE/EH-0573. “Environmental Management Systems Primer for Federal Facilities,” 12-97

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# Appendix

## PROJECT LIFE CYCLES

### C.1 EXAMPLE PROJECT LIFE CYCLES AND PROJECT PHASES

This Appendix highlights the simplified models associated with the four project types and tabulate typical samples, inputs and deliverables, decisions, and document links for project management and IPT use. The following discussion is provided to guide and assist program and project organizations to quickly see and understand a broad timeline by project type including how the phases, critical decisions, major input/milestones, and deliverables link. The examples reflect considerable past experience and have been updated consistent with the ongoing evolution of both DOE and Federal acquisition management guidelines.

#### C.1.1 System Projects

As projects are most often unique, the development of a universal timeline description that fits all projects is difficult. There are, however, common attributes. The most common of these is the System project that was discussed in Section 4.1. These projects can range from construction of a fairly simple facility, major equipment procurement and installation (Major Items of Equipment) and in many cases design-building of complex integrated systems requiring design, procurement, testing, and construction, all occurring with some overlap or concurrency. Additionally, in real life, overlaps and gray areas between phases are expected and are the norm.

System projects follow these steps or stages:

- **Pre-Acquisition Activities.** Mission need is identified, developed, and justified along with program objectives, end-state requirements, and the beginning of acquisition strategy planning. Program/project sponsors are identified along with preliminary NEPA strategies and processes. The project type is identified; risks identified; outline requirements defined; alternatives analyses and trade-off studies identified and initiated; required research, development, and testing identified and initiated; a PM identified; an IPT organized; and Critical Decision-0 requested and approved.

- Conceptual Design. AS is completed, risk-assessed, evaluated, and issued; contracts for conceptual design awarded; conceptual design completed and a CDR prepared; functional and operational requirements defined; a preliminary PEP prepared; preliminary baseline ranges (technical scope, schedule and cost) established; a Preliminary Hazards Analysis prepared; Environmental, Safety, Health & Quality requirements identified and defined; a RMP prepared including its risk analysis; and Critical Decision-1 requested and approved.
- Preliminary/Final Design. Design efforts continue with construction and procurement documents completed; long-lead procurements identified, funds obtained, and contracts awarded; baseline ranges approved; alternative studies, and development and testing activities completed; a Preliminary Safety Analysis prepared; and Critical Decision-2 and Critical Decision-3 requested and approved.
- Procurement/Construction. Contracts for procurements and construction awarded; permits obtained; turnover and startup plans developed, approved and issued; Final Safety Analysis Report issued; operating and maintenance manuals prepared; and procurement and construction completed.
- Acceptance/Completion. Construction completed, tested, approved, and accepted; performance criteria met; IOC verified; RA or ORR completed; drawings and specifications as-built; operations and maintenance training completed; Critical Decision-4 requested and approved; and transition to and acceptance by the user completed.

#### ***C.1.1.1 Simplified Design-Build Projects***

Some projects, due to their scope and makeup, may lend themselves to being expedited through the project management process. Projects that lend themselves to this approach have few unknowns, have no new technology requirements, very little system integration, and are not substantially unique or one-of-a-kind. Generally, projects like road building, administrative facilities, fire stations, etc., may be considered as simplified design-build projects. These kinds of projects may lend themselves to being packaged as design-build projects, where much of the preliminary and final design is completed by a contractor or contractor team who will also build the facility. This may be accomplished by taking the conceptual design effort to a more mature functional design package, but not all the way to a final design. This more mature package, along with the other required procurement items, then provides a bases for a bid package that allows the Government to secure lump sum competitive bids which tie the final design details to the construction, thereby eliminating the potential conflict and changes between two separate identities. However, this is offset by the need for the Government to firmly define its needs, requirements, and scope to prevent cost and schedule growth due to changing requirements after contract placement. To properly execute a project like this may require the combination of Critical Decision-1, Critical Decision-2, and possibly Critical Decision-3. In all cases, this approach and its bases

should be documented and approved as part of the Critical Decision-1 or Critical Decision-1-2 package and risk-assessed in the AS prior to bidding. Since project baselining will be affirmed as part of the bid and placement process, an early preliminary Project Data Sheet (PDS) may have to be submitted prior to this and should be worked with and into the DOE budgeting process. Utilization of PED funds, and decisions associated with activities like independent project reviews (IPRs), external independent reviews (EIRs), and independent cost reviews (ICRs) should be made as part of the initial planning and approved as early as possible—always prior to bidding. It is imperative that the Government fully establish scope and requirements so they are clear and included in the bidding documents.

### **C.1.2 Environmental Management Projects**

EM projects typically require the same decisions as System projects—and even though the project phases may be different, they are expected to effectively utilize Critical Decisions. In order to tailor the Critical Decisions for EM projects, they may be combined and/or rearranged as necessary to meet the scope of work. They are not, however, normally deleted. Projects and acquisition phases are determined through a site evaluation that reviews (for the entire site): historical records, production reports, audit reports, interviews with operations personnel, and so forth, with the intent of identifying all areas that might be contaminated by past activities. These areas may be grouped together to form operable or waste units based on geographic location, type and amount of contamination, regulatory drivers, or some other criteria that is agreeable to the responsible organization. Remediation of operable or waste units is accomplished through establishment and execution of projects. Therefore, EM has identified its work in the following categories:

- EM System projects
- Environmental Restoration (ER) projects
- Disposition projects (transition, deactivation, and decommissioning).

A simplified acquisition process for EM projects is described in the following sections.

#### ***C.1.2.1 Environmental Management System Projects***

EM work that is categorized as a System project will be projectized and managed as a project, consistent with Section 4.2.1. The acquisition process is the same as the System project model, except there are often more regulatory drivers that initiate the project activity.

#### ***C.1.2.2 Environmental Restoration Projects***

Restoration projects are executed in accordance with applicable Federal and state regulatory requirements including RCRA; CERCLA; and tri-party agreements (e.g., Federal Facility Agreement). The phases of ER activities and their relation to Critical Decisions are presented in Appendix C. ER projects for a specific waste site often contain multiple sub-

units with various remedies (e.g., source removal and groundwater treatment) that may result in multiple Critical Decisions for each phase. Multiple sub-units will be documented in an appropriately tailored PEP.

### ***C.1.2.3 Disposition Projects***

Disposition projects address the decommissioning of surplus contaminated facilities. Decommissioning activities involve the decontamination and safe disposition of facilities that have been deactivated. Safe disposition may include:

- Reuse of a decontaminated building
- Demolition of a facility with rubble removed from the site
- Entombment which might involve collapsing a structure and capping the contaminated rubble in place.

Disposition projects follow a decision-making process similar to that of ER projects—characterization, followed by detailed analysis of alternatives, and formal remedy selection. However, there are differences to be considered, as shown in Appendix C.

### **C.1.3 Information Technology Projects**

Although IT projects may have some uniquely different requirements and deliverables, the processes and approach to Critical Decisions and associated deliverables can be adapted from information provided in following sections. The phases of IT activities and their relation to Critical Decisions are presented.

Similar to more traditional DOE projects, IT projects may propose partial Critical Decision approval as needed for specific activities (e.g., long-lead Commercial Off-The-Shelf [COTS] purchases). IT projects are to comply with OMB Circular A-130 and utilize the DOE “Guide to IT Capital Planning and Investment.”

## **C.2 PROJECT OVERVIEW CHARTS**

Simplified models associated with the four most common project types: system projects, ER projects, disposition, and IT are graphically represented in the following tables. They are provided as a broad guide to assist program and project organizations to quickly see and understand the specific project timeline, by type, and includes how the phases, critical decisions, major input/milestones, and deliverables link together. Typical inputs and outputs/deliverables, decision points, and documents are listed for project management and IPT use. These examples reflect considerable past experience and have been updated consistent with the ongoing evolution of both DOE and Federal acquisition management guidelines.

Phases	Initiation	Definition
	<b>Pre-Acquisition</b>	<b>Conceptual Design</b>
<u>CRITICAL DECISIONS</u>	★ CD-0 Approve Mission Need	★ CD-1 Approve System Requirements and Alternatives
<u>FUNDING</u>	<div> <div>←</div> <div>OPERATIONS COST (Prior Year Cost)</div> <div>→</div> </div>	
		<b>Total Project Cost (TPC)</b>
<u>MAJOR INPUT ITEMS</u>	<ul style="list-style-type: none"> <li>Problem/Need Definition</li> <li>Document Proposed Modification</li> <li>Conceptual Design</li> <li>Decision Estimate &amp; Budgets</li> </ul>	<ul style="list-style-type: none"> <li>Permit Requirements</li> <li>Facility Scope</li> <li>Preliminary Tech Development Input</li> <li>RA or ORR Applicability</li> </ul>
<u>MAJOR ACTIVITIES</u>	<ul style="list-style-type: none"> <li>Establish Project Team</li> <li>Establish Program/Project Planning Budget</li> <li>Develop Project Scope</li> <li>Identify Customer Expectations</li> <li>Identify Key Schedule Drivers</li> <li>Identify Funding Constraints</li> <li>Identify High-Level Functions and Requirements</li> <li>Identify Project-Level Interfaces</li> <li>Identify Capital &amp; Life-Cycle Cost Drivers</li> <li>Develop Pre-Acquisition Design Schedule</li> <li>Develop Conceptual Design Schedule Range</li> <li>Develop Market Plan</li> <li>Develop Up-Front Conceptual Design Business Decision Estimate &amp; Budgets</li> <li>Dev Pre-Acquisition Design Budget</li> <li>Establish Placeholder in Out-Year Budget</li> </ul>	<ul style="list-style-type: none"> <li>Initiate Pre-Acquisition Planning and Design</li> <li>Assess Technology Maturity Phase Plan</li> <li>Submit Critical Decision-0 Pkg</li> <li>Develop Project-Level Functions and Requirements</li> <li>Identify Pre-Acquisition Risks</li> <li>Perform Alternative/Value Management Studies</li> <li>Identify Long-Lead or Special Procurement</li> <li>Establish Conceptual Design Budget &amp; Schedule</li> <li>Develop Preliminary Design &amp; Schedule Range</li> <li>Develop Preliminary/Final Design Range</li> <li>Develop TPC &amp; Schedule Range</li> <li>Prelim. Environmental Strategy</li> <li>Identify Current &amp; Next 2 FYs Funding Requirements</li> <li>Initiate PDS for Design</li> </ul>
<u>MAJOR DELIVERABLES</u>	<ul style="list-style-type: none"> <li><b>OUTPUTS:</b> <ul style="list-style-type: none"> <li>Market Plan</li> <li>Conceptual Design Business Decision Estimate &amp; Budgets</li> <li>High-Level Functions &amp; Requirements</li> <li>Pre-Acquisition Design Budget</li> <li>Pre-Acquisition Design Schedule</li> <li>Conceptual Design Schedule Range</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>AS in the PASD</li> <li>Statement of Mission Need</li> <li>Minimum Technical and Functional Requirements</li> <li>PDS for Design with Special Procurement Disclosure</li> <li>Tech Task Request</li> <li>Technology Development Issues</li> <li>Program Plan</li> <li>Preliminary/Final Design &amp; Prelim Schedule Range</li> <li>TPC &amp; Schedule Range</li> <li>Mission Need Independent Project Review</li> <li>Conceptual Design Budget &amp; Schedule</li> </ul>
		<ul style="list-style-type: none"> <li>Acquisition Strategy</li> <li>Project Expectations Summary</li> <li>SOW for Design</li> <li>CA/EIS/Record of Decision</li> <li>Systems Engineering Mgmt Plan</li> <li>Conceptual Design Package</li> <li>Preliminary PEP</li> <li>Preliminary Hazard Analysis Report</li> <li>Preliminary Team Execution Plan</li> <li>RMP</li> <li>Preliminary Design Phase Budget and Schedule</li> <li>Verification of Mission Need</li> <li>Critical Decision-1 Package</li> <li>Updated TPC &amp; Schedule Range</li> <li>Formal Value Management Plan</li> </ul>

**Project Overview for System Projects (Initiation - Definition Phases)**

Phases	Execution			Transition/ Closeout
	Preliminary Design	Final Design	Procure / Construct	Acceptance / Completion
	Special Procurement		Remaining Procurement	
<u>CRITICAL DECISIONS</u>	★ CD-2 Approve APB	★ CD-3 Authorization to Implement	★ CD-4 Approve Transition and Turnover	
<u>FUNDING</u>	Total Project Cost (TPC)			
	TOTAL ESTIMATED COSTS (TEC – WITH MINOR OPC)			OPC (with Minor TEC)
	PROJECT ENGINEERING & DESIGN FUNDS (PED)			
<u>MAJOR INPUT ITEMS</u>	<ul style="list-style-type: none"><li>Approval of Preliminary Baseline Range</li><li>Project Authorization</li><li>Facility Scope Package</li><li>TPC &amp; Schedule Range</li><li>Special Requirements</li></ul>	<ul style="list-style-type: none"><li>Approved Baselines</li><li>Source Documents</li><li>Technology Development Output</li></ul>	<ul style="list-style-type: none"><li>Issued for Construction Design Documents</li><li>Material and Equipment</li><li>Construction Permits</li></ul>	<ul style="list-style-type: none"><li>Completed Systems</li></ul>
<u>MAJOR ACTIVITIES</u>	<ul style="list-style-type: none"><li>Define Special Procurement</li><li>Develop, Validate, &amp; Issue Phased Package, if Necessary</li><li>Finalize Permit Requirements</li><li>Finalize Team Execution Plan</li><li>Commit Critical Equipment</li><li>Initiate Pulse Surveys</li><li>Perform Process Hazards Review</li><li>Project Site Selection</li><li>Update PEP</li><li>Update Technical and Programmatic Risk Analysis</li><li>Perform Formal Value Management</li><li>Develop Baselines</li><li>Develop Critical Decision-2 Package</li><li>Define Critical Decision-3 Deliverables &amp; Completion Criteria</li><li>Update Annual/Out-Year BA</li><li>Prepare PDS for Construction</li><li>Conduct EIR</li><li>Conduct ICR or Estimate</li></ul>	<ul style="list-style-type: none"><li>Receive Critical Vendor Data</li><li>Finalize 3D Computer Aided Drafting and Design Setup</li><li>Complete Design Model</li><li>Conduct Technical Innovations Evaluation</li><li>Finalize Planning Drawings</li><li>Finalize Field Support Plan</li><li>Review Safety Action Plan</li><li>Perform Final Design Review</li></ul>	<ul style="list-style-type: none"><li>Start Site Work</li><li>Complete Procurement of Materials and Equipment</li><li>Start Systems Completion</li><li>Initiate Document Closeout Process</li><li>Work off Punch Lists</li></ul>	<ul style="list-style-type: none"><li>Startup/ Commissioning Testing</li><li>Verification of Performance Criteria</li><li>Lessons Learned Document</li></ul>
<u>MAJOR DELIVERA BLES</u>  Note: Deliverable s from each phase are input to subsequent phases	<ul style="list-style-type: none"><li>Review of Contractor Project Mgmt System</li><li>Preliminary Design Detailed Schedules</li><li>Issued for Design Source Documents</li><li>Assignment of Responsibilities Matrix</li><li>Performance Metrics</li><li>Staffing Plans</li><li>Tech Risk Analysis Report</li><li>Technology Development Output</li><li>Prelim Safety Analysis Report</li><li>Final PEP</li><li>Critical Decision-2 Package</li><li>TPC Estimate</li><li>EVMS certify</li><li>ICR</li><li>NEPA Documentation</li><li>PDS for Construction</li><li>Performance Baseline Independent Review</li></ul>	<ul style="list-style-type: none"><li>Equipment and Material Requisitions</li><li>Issue for Construction Design Documents</li><li>100% Definitive Estimate</li><li>Integrated Project Schedule and Sub-tier Schedules</li><li>Updated PEP &amp; Performance Baseline</li><li>Final Design &amp; Procurement Pkgs</li><li>Verification of Mission Need Budget &amp; Congressional Authorization</li><li>Approved Safety Documentation</li><li>Execution Readiness</li><li>Independent Review</li><li>Updated Construction PDS</li></ul>	<ul style="list-style-type: none"><li>Turnover &amp; Startup Plan</li><li>Operating and Maintenance Manuals</li><li>Construction Completion</li><li>Startup Commissioning Test Plan</li><li>Final Safety Analysis Report</li><li>Annual Updated Construction PDS</li></ul>	<ul style="list-style-type: none"><li>ORR &amp; Acceptance Report</li><li>Approval for Acceptance</li><li>As-Built Drawings</li><li>Final Safety Report</li><li>Project Completion Report</li></ul>

**Project Overview for System Projects (Execution – Transition/Closeout Phases)**



Phases	Initiation		Definition
	Site Evaluation	Remedial Investigation/ Feasibility Study or RFI/Corrective Measures Study	SB/PP & Record of Decision
<u>CRITICAL DECISIONS</u>	★ CD-0 Approve Mission Need		★ CD-1 Approve System Requirements and Alternatives
<u>FUNDING</u>	Operations Funded		
<u>MAJOR INPUT ITEMS</u>	<ul style="list-style-type: none"> <li>- Historical Records</li> <li>- Site Visit</li> <li>- Interviews</li> <li>- Health and Safety Plan</li> </ul>	<ul style="list-style-type: none"> <li>- PA/SI Report</li> <li>* RFA Report</li> <li>- Updated Health and Safety Plan</li> </ul>	<ul style="list-style-type: none"> <li>- Constituents of Concern,</li> <li>- Remedial Action Objectives</li> <li>- Remedial Goal Options (or equivalents)</li> <li>+ RI/BRA Summary Report</li> <li>+ FS Report</li> <li>* Corrective Measures Study Report</li> <li>* RCRA Part B Permit</li> </ul>
<u>MAJOR ACTIVITIES AND DELIVERABLES</u>	<ul style="list-style-type: none"> <li>+ Preliminary Assessment/ Site Investigation (PA/SI) Report</li> <li>* RCRA Facility Assessment (RFA) report</li> <li>* RCRA Part A Permit</li> <li>+ Land Use Control Assurance Plan</li> </ul>	<ul style="list-style-type: none"> <li>- Establish Project Team</li> <li>- Identify Key Schedule Drivers</li> <li>- Identify Funding Constraints</li> <li>- Identify Project-Level Interfaces</li> <li>- Identify Project Risks</li> <li>- Prepare Life Cycle Cost Estimate</li> <li>- Scope</li> <li>- Schedule</li> <li>- Cost</li> <li>- Prepare Work Plan</li> <li>- Characterization</li> <li>- Identify:               <ul style="list-style-type: none"> <li>- Constituents of Concern,</li> <li>- Remedial Action Objectives,</li> <li>- Remedial Goal Options (or equivalent)</li> </ul> </li> <li>- Conceptual Site Models</li> <li>- Fate &amp; Transport Model</li> <li>+ RI/BRA Summary Report</li> <li>+ Prepare FS Report</li> <li>* Prepare CMS Report</li> <li>* RCRA Part B Permit</li> <li>- Treatability Studies/Reports</li> </ul>	<ul style="list-style-type: none"> <li>- Prepare PEP</li> <li>- Prelim. Engineering Deliverables               <ul style="list-style-type: none"> <li>- Hazard Classification</li> <li>- Performance Reqs.</li> <li>- Performance Assessment</li> <li>- Safety Documentation</li> <li>- Emergency Preparedness</li> <li>- Safeguards &amp; Security Reqs</li> <li>- Waste Management Plan</li> </ul> </li> <li>+ Land Use Control Implementation Plan</li> <li>+ Prepare Proposed Plan</li> <li>* Prepare Statement of Basis</li> <li>+ Prepare Record of Decision</li> <li>* Closure Plan</li> <li>* Corrective Action Plan</li> <li>- Prepare RMP</li> <li>- Update Life Cycle Cost Estimate</li> <li>- Perform EM-PDRI</li> <li>- IPR</li> <li>- Prepare Critical Decision-0/1 Package</li> <li>- Value Management Plan</li> </ul>

**Notes:**

- Items are applicable to CERCLA and RCRA.
  - + Items are applicable to CERCLA only.
  - \* Items are applicable to RCRA only.
- RI/FS = Remedial Investigation/Feasibility Study  
RFI = RCRA Feasibility Investigation  
CMS = Corrective Measures Study

**Project Overview for Environmental Restoration Projects**

Phases	Execution		Transition /Closeout
	Engineering	Construction/ Remediation	Acceptance/Completion
<u>CRITICAL DECISIONS</u>	★ <b>CD-2/3</b> <b>Approve APB</b> <b>and Start Remediation</b>		★ <b>CD-4</b> <b>Approve Transition</b> <b>and Turnover</b>
<u>FUNDING</u>	<b>Total Project Cost (TPC) (Operations Funded)</b>		<b>TPC (Operations Funded)</b>
<u>MAJOR INPUT ITEMS</u>	+ RI/BRA Summary Report + Feasibility Study * Corrective Measures Study + Proposed Plan * Statement of Basis * Closure Plan * Corrective Action Plan	- Permits - Design Documents - Updated Health and Safety Plan - Waste Management Plan	- Operations/Maintenance Manuals & Procedures - Final As-builts
<u>MAJOR ACTIVITIES AND DELIVERABLES</u>	- Update PEP - Update Models as applicable  - Final Design Deliverables <ul style="list-style-type: none"> <li>- Hazard Analysis</li> <li>- Performance Assessment</li> <li>- Safety Documentation</li> <li>- Emergency Preparedness</li> <li>- Safeguards and Security Req's</li> <li>- Waste Management Plan</li> <li>- Pollution Prevention Plan</li> <li>- Stormwater Management Plan</li> <li>- Other Permits as required</li> <li>- Design Specs and Drawings</li> <li>- Procurement Packages</li> </ul> + Post Record of Decision Documentation ** + Remedial Design Work plan + Remedial Design Report + Remedial Action Work Plan - Environmental Monitoring Plan - Update RMP - Update Life Cycle Cost Estimate - Perform EM-PDRI - External Independent Review - Prepare Critical Decision- 2/3 Package - Construction Readiness Review - VM Review/Recommendations	- Subcontract Award - Remedial Action Construction - Final As-builts - Operations/ Maintenance Manuals & Procedures	+ Final Remediation Report (if applicable) - Complete Critical Decision-4 Package - Readiness Review, if required - Turned Over Systems or Closed Site + Post Construction Report - Turnover and Startup Plan * Closure Certification - Effectiveness Monitoring Plan
<div> <b>Notes:</b> <ul style="list-style-type: none"> <li>- Items are applicable to CERCLA and RCRA.</li> <li>+ Items are applicable to CERCLA only.</li> <li>* Items are applicable to RCRA only.</li> <li>**Some sites have been combined these into one—the “Remedial Action Implementation Plan.”</li> <li>RI/FS = Remedial Investigation/Feasibility Study</li> <li>RFI = RCRA Feasibility Investigation</li> </ul> </div>			

**Project Overview for Environmental Restoration Projects (Execution – Transition/Closeout)**

Phase	Initiation	Definition
	<b>Pre-Acquisition Planning</b>	<b>Conceptual Design</b>
<b><u>CRITICAL DECISIONS</u></b>	★ CD-0 Approve Mission Need	★ CD-1/2 Approve Acquisition Performance Baseline (Detailed Work Plan)
	<b>Program Funding</b>	<b>Decontamination &amp; Decommissioning Project Funding</b>
<b><u>MAJOR INPUT ITEMS</u></b>	<ul style="list-style-type: none"> <li>Historical Records and Drawings</li> <li>GSA approval to decommission</li> </ul>	<ul style="list-style-type: none"> <li>Decision to proceed with decommissioning</li> <li>Interviews</li> <li>Health and Safety Plan and RadCon Programs</li> <li>Develop Site programs &amp; agreements on cleanup levels</li> <li>Key schedule drivers</li> <li>Key funding constraints</li> <li>Preliminary Scope / Schedule</li> </ul>
<b><u>MAJOR ACTIVITIES</u></b>	<ul style="list-style-type: none"> <li>Continue Surveillance &amp; Maintenance</li> <li>Identify Project Risks</li> <li>Prep Life Cycle Cost Estimate</li> <li>Preliminary Scope</li> <li>Preliminary Schedule</li> <li>Preliminary Cost</li> </ul>	<ul style="list-style-type: none"> <li>Prepare Engineering Eval/Cost Assessment (EE/CA)</li> <li>Evaluate available process knowledge / historical data</li> <li>Conduct Preliminary Hazard Classification</li> <li>Conduct &amp; Document Final Hazard Classification</li> <li>Perform Plant Forces Work Review and plan for appropriate implementation of project</li> <li>Prepare DQO &amp; Sampling / Analysis Plan</li> <li>Public Review &amp; Comment on EE/CA</li> <li>Prepare Removal Action Work Plan which includes the waste management plan and air monitoring plan</li> <li>Develop QA Project Plans</li> <li>Prepare Field Implementation Guide (if needed)</li> <li>Obtain regulator approvals for EE/CA, Removal Action Work Plan and Sampling and Analysis Plan</li> <li>Develop / Update Project Scope / Cost / Schedule for DWP based on RAWP / Action Memo</li> <li>Prepare End Point Criteria</li> <li>Prepare Emergency Plans (as needed)</li> <li>Waste Characterization Sampling</li> <li>Perform Waste Designation and Planning</li> <li>Perform Value Management Planning</li> </ul>
<b><u>MAJOR DELIVERABLES</u></b>	<ul style="list-style-type: none"> <li>Health and Safety Plan and RadCon Programs</li> <li>Decision if Time Critical or Emergency Action is needed</li> <li>Identify key schedule drivers</li> <li>Identify key funding constraints</li> <li>Develop Site programs and agreements on cleanup levels</li> <li>Prepare Critical Decision-0/1 Package</li> </ul>	<ul style="list-style-type: none"> <li>Action Memorandum</li> <li>Removal Action Work Plan / Waste Mgmt Plan</li> <li>Sampling &amp; Analysis Plan</li> <li>Independent Verification determination by DOE</li> <li>Final Hazard Classification and Authorization Basis Document</li> <li>Document project Scope / Cost / Schedule in the Detailed Work Plan</li> <li>Prepare Critical Decision-2/3 Package</li> </ul>

Note 1: The process outlined here is for facilities included within a site where the decision has already been made to perform decommissioning under CERCLA.

**Project Overview for Disposition Projects (Initiation – Definition)**

Phase	Execution			Transition/Closeout
	Preliminary Design	Final Design	Construction	Final Characterization and Completion
<u>CRITICAL DECISIONS</u>	★ CD-3 Approve Start of Execution of Disposition or Remedial Action			★ CD-4 Approve Transition and Turnover
	D&D Project Funding			Long Term S&M Program Funding
<u>MAJOR INPUT ITEMS</u>	<ul style="list-style-type: none"> <li>Action Memorandum</li> <li>Removal Action Work Plan</li> <li>Sampling &amp; Analysis Plan</li> <li>Independent Verification determination by DOE</li> <li>Final Hazard Classification Document and Authorization Basis Document</li> <li>Document Project Scope / Cost / Schedule in the Detailed Work Plan</li> <li>Waste Designation and Plans</li> </ul>			<ul style="list-style-type: none"> <li>Closeout Verification Package approved by regulators</li> <li>Documentation of any remaining underground waste sites</li> <li>S&amp;M Plan and Final Hazard Classification / Authorization Basis Document for the Long Term S&amp;M phase</li> <li>Approved End Point Criteria Package</li> </ul>
<u>MAJOR ACTIVITIES</u>	<ul style="list-style-type: none"> <li>Award Subcontract(s) as needed</li> <li>Prepare Work Plans for various stages of work</li> <li>Perform RA (as needed)</li> <li>Implement the RAWP per the project schedule</li> <li>Conduct environmental release / verification sampling per the approved Sampling and Analysis Plan</li> <li>Prepare DQA and Closeout Verification Package</li> <li>Document End Point Criteria completion</li> <li>Prepare S&amp;M Plan and Final Hazard Classification / Authorization Basis Document for the Long Term S&amp;M phase</li> <li>"As-Built" drawings as needed</li> <li>Prepare Decommissioning Project Final Report and NPL Closeout Forms as needed</li> <li>Prepare DWP for LT S&amp;M</li> <li>Value Management Reviews/Recommendations</li> </ul>			<ul style="list-style-type: none"> <li>Implement Long Term S&amp;M Plan</li> </ul>
<u>MAJOR DELIVERABLES</u>	<ul style="list-style-type: none"> <li>Closeout Verification Package approved by regulators</li> <li>Documentation of any remaining underground waste sites</li> <li>Prepare Critical Decision-4 Package</li> <li>End Point Closure Package</li> </ul>			<ul style="list-style-type: none"> <li>Periodic Reports as required by long Term S&amp;M Plan</li> </ul>

Note 1: The process outlined here is for facilities included within a site where the decision has already been made to perform decommissioning under CERCLA.

**Project Overview for Disposition Projects (Execution – Transition/Closeout)**

Phases	Initiation	Definition	
IT Projects	Need Determination, Strategy Justification & Prioritization	Planning	Requirements Definition
	★ CD-0 Approve Mission Need		★ CD-1 Approve System Requirements and Alternatives
<u>CRITICAL DECISIONS</u>			
<u>MAJOR INPUT ITEMS</u>	<ul style="list-style-type: none"> <li>- Mission Need</li> </ul>	<ul style="list-style-type: none"> <li>- DOE-Approved Task Assignment (Critical Decision-0 Approval)</li> <li>- Initial Project Scope</li> </ul>	<ul style="list-style-type: none"> <li>- Project File</li> <li>- Preliminary Project Plan</li> <li>- High-level Project Requirements</li> </ul>
<u>MAJOR ACTIVITIES</u>	<ul style="list-style-type: none"> <li>- Establish Preliminary Project Team</li> <li>- MNS Documented</li> <li>- Identify Schedule and Cost Drivers, Funding Constraints and Other Assumptions</li> <li>- Identify High-level Functions &amp; Requirements</li> <li>- Identify Project Interfaces</li> <li>- Establish Placeholder on OY Budget</li> <li>- MNS included in IT Investment Portfolio</li> <li>- Strategy Selected for Investment</li> <li>- Perform Alternative/Value Management Studies (make-buy, alternate products, alternate designs)</li> <li>- Perform Life cycle Cost Analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Analyze User Environment</li> <li>- Define Project Objectives</li> <li>- Define Project Scope</li> <li>- Develop High-Level Project Requirements</li> <li>- Establish Communications with Functional Areas</li> <li>- Determine Project Feasibility</li> <li>- Develop Project Plan</li> <li>- Develop Software QAP</li> <li>- Conduct In-Stage Assessment</li> <li>- Conduct Exit Stage Assessment</li> </ul>	<ul style="list-style-type: none"> <li>- Develop Software Configuration Management Plan</li> <li>- Document Project Requirements</li> <li>- Develop Project Test Plan</li> <li>- Develop Acceptance Test Plan</li> <li>- Revise and Approve Project Plan</li> <li>- Software Requirements Specification Approved</li> <li>- Conduct In-Stage Assessment</li> <li>- Conduct Exit-Stage Assessment</li> <li>- VM Planning</li> </ul>
<u>MAJOR DELIVERABLES</u>	<ul style="list-style-type: none"> <li>- Strategy for Meeting Mission Need</li> <li>- High-Level Functions &amp; Requirements</li> <li>- Business Decision Range Estimates</li> <li>- Next Phase Budget &amp; Schedule</li> <li>- Initial Project Scope</li> <li>- Initial Cost Benefit</li> <li>- Risk Comparisons/Analysis</li> <li>- Letter to DOE Project Pkg</li> <li>- TPC BDER &amp; Schedule Range</li> <li>- Risk &amp; Opportunity Mgmt. Plan</li> <li>- Critical Decision-0 Package</li> </ul>	<ul style="list-style-type: none"> <li>- Project File</li> <li>- Project Objectives, Scope, and Plan</li> <li>- Feasibility Statement</li> <li>- Preliminary Project E-Plan</li> <li>- Software Quality Assurance Plan</li> <li>- Revised BDER &amp; Schedule Range</li> <li>- Revised Risk Reduction/Analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Software Configuration Management Plan</li> <li>- Continuity of Operations Statement/Plan</li> <li>- Software Requirements Specification</li> <li>- Final BDER &amp; Schedule Range</li> <li>- Revised Budget &amp; Schedule</li> <li>- Revised Risk Reduction/Analysis</li> <li>- Verif. of Mission Need</li> <li>- Project Test Plan</li> <li>- Acceptance Test Plan (draft)</li> <li>- Critical Decision-1 Package</li> </ul>

**Project Overview for IT Projects (Initiation – Definition)**

\*Some activities in these phases are NOT capital funded (Key Activities have an asterisk on the chart).  
 Data conversion, development of data conversion programs, the purging or cleansing of existing data, reconciliation or balancing of data, and the creation of new/additional data should all be expense funded.  
 Development of training, training the acceptance team, training end users, and acceptance testing of the software by the software owner organization should be expense funded.  
 Complete guidance is provided in FASAB 10 and related guidance.

Phases	Execution				Transition/ Closeout
IT Projects	Functional Design	System Design	Programming	Integration	Installation / Acceptance
CRITICAL DECISIONS	★ CD-2 Approve APB	★ CD-3 Authorization to Implement			★ CD-4 Approve Transition and Turnover
MAJOR INPUT ITEMS	<ul style="list-style-type: none"> <li>- Software Req's Specification</li> <li>- Critical Decision-1 Approval Letter</li> <li>- Prior Phase Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>- Functional Design Document</li> <li>- APB Phase PEP</li> </ul>	<ul style="list-style-type: none"> <li>- System Design Doc</li> <li>- Prior Phase Project Plan</li> <li>- Project Baseline</li> <li>- Critical Decision-3 Approval Ltr.</li> </ul>	<ul style="list-style-type: none"> <li>- Software Baseline</li> <li>- Prior Phase Project Plan</li> </ul>	<ul style="list-style-type: none"> <li>- Software Baseline</li> <li>- Documentation Baseline</li> <li>- Prior Phase Project Plan</li> </ul>
MAJOR ACTIVITIES	<ul style="list-style-type: none"> <li>- Determine Software Structure</li> <li>- Design System Inputs and Outputs</li> <li>- Design User Interfaces</li> <li>- Design System Interfaces</li> <li>- Build Logical Model</li> <li>- Build Data Model</li> <li>- Develop Functional Design/ COTS Request for Proposal</li> <li>- Receive Proposal from Vendor</li> <li>- Initiate Procurement of Hardware and Software</li> <li>- Revise Project Plan</li> <li>- Functional Design Document Approved</li> <li>- Conduct In-Stage Assessment</li> <li>- Conduct Exit Stage Assessment</li> </ul>	<ul style="list-style-type: none"> <li>- Create Software Module Specifications</li> <li>- Design Physical Database Structure</li> <li>- Dev Integration Test Plan</li> <li>- Dev System Test Plan</li> <li>- Develop Conversion Plan</li> <li>- Procure COTS Package</li> <li>- Perform COTS FIT/GAP Analysis</li> <li>- Perform COTS Pilot</li> <li>- Develop System Design/ COTS Configuration Doc</li> <li>- System Design Document Approved</li> <li>- Develop Detailed Project Schedules</li> <li>- Develop Project Baselines</li> <li>- Revise Project Plan</li> <li>- Conduct In-Stage Assessment</li> <li>- Conduct Exit Stage Assessment</li> <li>- VM Reviews/ Recommendations</li> </ul>	<ul style="list-style-type: none"> <li>- Develop Installation Plan</li> <li>- Establish Programming Environment</li> <li>- Write Programs/ Configure COTS</li> <li>- Write Data Conversion Programs</li> <li>- Conduct Unit Testing</li> <li>- Develop Plan for Transition to Operational Status</li> <li>- Develop Operating Documentation</li> <li>- Develop Training Program</li> <li>- Revise Project Plan</li> <li>- Conduct In-Stage Assessment</li> <li>- Conduct Exit Stage Assessment</li> <li>- Initiate Change Control System</li> </ul>	<ul style="list-style-type: none"> <li>- Conduct Integration Testing</li> <li>- Conduct System Testing</li> <li>- Initiate Acceptance Process</li> <li>- Train Acceptance Test Team</li> <li>- Revise Project Plan</li> <li>- Module Tests Complete</li> <li>- Integration Tests Complete</li> <li>- Conduct In-Stage Assessment</li> <li>- Conduct Exit Stage Assessment</li> </ul>	<ul style="list-style-type: none"> <li>- Conduct Installation Tests</li> <li>- Install Software in Acceptance</li> <li>- Conduct User Training</li> <li>- Conduct Acceptance Test</li> <li>- Close Acceptance Process</li> <li>- Acceptance Tests Completed</li> <li>- Conduct In-Stage Acceptance</li> <li>- Conduct Exit Stage Assessment</li> <li>- Conduct Operations Training</li> </ul>
MAJOR DELIVERABLES	<ul style="list-style-type: none"> <li>- Logical Model</li> <li>- Revised Risk Reduction/ Analysis</li> <li>- Request for Proposal</li> <li>- Vendor Proposal</li> <li>- Revised Budget &amp; Schedule</li> <li>- Revised Project Plan</li> <li>- Data Dictionary</li> <li>- Requirements Traceability Matrix</li> <li>- Functional Design Document</li> <li>- Critical Decision-2 Package</li> </ul>	<ul style="list-style-type: none"> <li>- Physical Model</li> <li>- Revised Risk Reduction/Analysis</li> <li>- Design Integration Test Plan (draft)</li> <li>- System Test Plan (draft)</li> <li>- Conversion Plan</li> <li>- System Design Document/COTS Configuration Document</li> <li>- COTS Product</li> <li>- Program Specifications</li> <li>- Project Baselines</li> <li>- Programming Standards</li> <li>- Detailed Project Sched</li> </ul>	<ul style="list-style-type: none"> <li>- Installation Plan (draft)</li> <li>- Integration Test Plan (draft)</li> <li>- System Test Plan (draft)</li> <li>- User Training Mat'rl</li> <li>- Software Baseline (Programmed and/ or COTS config.)</li> <li>- Transition Plan</li> <li>- Operating Documents (draft)</li> <li>- Training Plan (draft)</li> </ul>	<ul style="list-style-type: none"> <li>- Integration Test Reports</li> <li>- System Test Report</li> <li>- Operating Documents (draft)</li> <li>- Training Plan (final)</li> <li>- Installation Plan (final)</li> <li>- Acceptance Test Plan (final)</li> <li>- Pre-acceptance Checklist</li> </ul>	<ul style="list-style-type: none"> <li>- Acceptance Test Report</li> <li>- Acceptance Checklist</li> <li>- Operational System</li> <li>- Critical Decision-4 Package</li> </ul>
<p>Information Technology Investment Guidance is provided via the Clinger-Cohen Act and related DOE Order 200.1. IT Projects are developed in phases guided by DOE Guide 200.1-1. This chart relates the up-front investment planning and G200.1-1 phases and Critical Decisions for a typical construction project. It provides a project management roadmap for IT programs and projects. Definitions and detailed information for IT terms can be found in DOE G200.1-1.</p>					

**Project Overview for IT Projects  
(Execution – Transition/Closeout)**

Initiation	Definition
Pre-Acquisition	Conceptual Design
<b>Cost:</b> DOE approval if conceptual design costs exceed \$600,000 limit <b>Maturity:</b> Need estimated conceptual design cost	<b>Cost:</b> DOE Authorization <b>Maturity:</b> Need project cost and schedule range estimate
<b>Schedule:</b> No schedule requirements to go from Pre- to Conceptual Design	<b>Schedule:</b> DOE Approval <b>Maturity:</b> Need Preliminary Design schedule
<b>Technical:</b> Support the Conceptual Design Estimate <b>Maturity:</b> <ul style="list-style-type: none"> <li>Identify Assessments and studies</li> <li>Issue Design Criteria Orders, regulations, codes &amp; standards)</li> <li>Identify Functions and Requirements</li> <li>Identify Technology Development activities</li> <li>Information Utilization Strategy Mission</li> <li>Operational Strategy and Automation Strategy</li> <li>Performance Requirements</li> <li>Preliminary Vulnerability Assessment Study</li> <li>Preliminary Site Clearance Permit</li> <li>Review of Alternatives</li> <li>Risk Assessment</li> <li>Site Selection Criteria</li> <li>Small-Scale testing</li> <li>Systems Engineering Management Plan—Integrated Runs</li> <li>Technology development Program Plan <ul style="list-style-type: none"> <li>a) Program Research &amp; Development requirements</li> <li>b) Define Research &amp; Development program phase</li> </ul> </li> </ul> <b>Safety and Hazard Analysis / Vulnerability Assessments</b> <ul style="list-style-type: none"> <li>Draft Safeguards Requirements Identification Supported by: <ul style="list-style-type: none"> <li>–Preliminary VM Study</li> <li>–Hazard Assessment Document</li> <li>–Proposed Process Material Flow</li> </ul> </li> <li>Emergency Preparedness Hazard Survey and screen complete</li> <li>Hazard Assessment Document complete Supported by <ul style="list-style-type: none"> <li>–Facility Layout</li> <li>–Hazardous material inventory</li> </ul> </li> </ul>	<b>Technical:</b> Support cost & schedule and CDR <b>Maturity:</b> <ul style="list-style-type: none"> <li>Complete Alternative Studies</li> <li>Complete CDR</li> <li>Complete Facility Design Description, approve Facility RD (functional &amp; operational requirements, and draft Program Requirements</li> <li>Draft System Design Descriptions</li> <li>Complete conceptual Vulnerability Assessment Study</li> <li>Develop Key Technical Parameters</li> <li>Identify system boundaries</li> <li>Identify engineering development vs. proven process</li> <li>Identify permitting requirements</li> <li>Draft Interface Control Documents</li> <li>Identify prelim. structures &amp; systems and prelim. safety classifications</li> <li>Prepare Information Utilization Plan</li> <li>Prepare Operational/Automation Plan</li> <li>Preliminary Characterization and Site Selection</li> <li>Complete Proof of Concept Testing</li> <li>Prepare Regulatory Management Strategy</li> <li>Prepare RMP</li> <li>Complete NEPA (EA, EIS approved) requirements</li> <li>Complete Proof of Concept Testing</li> <li>Prepare Regulatory Management Strategy</li> <li>Prepare RMP</li> <li>Complete NEPA (EA, EIS approved) requirements</li> </ul> <b>Safety and Hazard Analysis / Vulnerability Assessments</b> <ul style="list-style-type: none"> <li>Preliminary Functional Classification complete Supported by: <ul style="list-style-type: none"> <li>–Preliminary Hazards Analysis</li> <li>–Selected Alternative Study</li> </ul> </li> <li>Preliminary Shielding Analysis complete Supported by: <ul style="list-style-type: none"> <li>–Facility Layout</li> <li>–Radiological material location</li> </ul> </li> <li>SRI Rev. 0 complete Supported by: <ul style="list-style-type: none"> <li>–Conceptual VM study</li> </ul> </li> </ul>

#### Project Documentation by Typical Phase (Initiation - Definition)



Execution		Transition/Closeout
Preliminary Design	Final Design	Construction/Startup/ Turnover
<b>Cost:</b> Congressional funding  <b>Maturity:</b> Project performance APB (TEC + OPC) including risk adjustments at Critical Decision-2	<b>Cost:</b> No special requirements to go from final design to construction—under change control <b>Maturity:</b> Critical Decision-3 approved, Critical Decision-4 complete at closeout	<b>Cost:</b> No requirements, under change control <b>Maturity:</b> Not Applicable
<b>Schedule:</b> Project schedule  <b>Maturity:</b> Project APB	<b>Schedule:</b> No special req'ts to go from final design to construction—under change control <b>Maturity:</b> Not Applicable	<b>Schedule:</b> No requirements, under change control <b>Maturity:</b> Not Applicable
<b>Technical:</b> Engineering and development completed, with risk allowances for open issues  <b>Maturity:</b> <ul style="list-style-type: none"> <li>Complete Accident Analysis</li> <li>Component requirements identified</li> <li>Configuration Mgmt. Plan issued</li> <li>Facility Design Description completed</li> <li>Final Site Characterization and Site Selection</li> <li>Initiate Pressure Protection Plan</li> <li>Process &amp; Instrumentation Diagram, Rev. 0 issued</li> <li>Interface Control Documents issued</li> <li>Prelim layout drawings of major SSCS completed</li> <li>Performance Verification               <ul style="list-style-type: none"> <li>a) Full-Scale Tests</li> <li>b) Refinement/Optimization—Engr-Scale tests</li> </ul> </li> <li>Material Balance</li> <li>Reliability, Availability, Maintainability Evaluation complete</li> <li>System Design Description at system level complete</li> <li>System boundaries identified</li> <li>Technology Development activities complete</li> <li>Updated RMP</li> <li>Value Management</li> </ul> <b>Safety and Hazard Analysis / Vulnerability Assessments</b> <ul style="list-style-type: none"> <li>As Low As Reasonably Achievable Review complete Supported by:               <ul style="list-style-type: none"> <li>–Preliminary design</li> </ul> </li> <li>Automation and info design Approach Finalized</li> <li>Preliminary Documented Safety Analysis/Preliminary Safety Analysis Report Issued</li> <li>Preliminary Emergency Plan Complete Supported by:               <ul style="list-style-type: none"> <li>–Preliminary Documented Safety Analysis / Preliminary Safety Analysis Report Rev. A</li> <li>–Preliminary Design</li> <li>–Project Cost Estimate</li> </ul> </li> </ul>	<b>Technical:</b> Complete design documentation  <b>Maturity:</b> <ul style="list-style-type: none"> <li>All detailed design drawings, calculations, specifications, etc. except field urn items complete</li> <li>Task Plans Issued</li> <li>ORR Planning and Preparation developed</li> <li>Finalize Pressure Protection Plan</li> <li>ORR Planning and Preparation developed</li> <li>Site Clearance Permit</li> </ul> <b>Safety and Hazard Analysis / Vulnerability Assessments</b> <ul style="list-style-type: none"> <li>Accident Analysis complete Supported by:               <ul style="list-style-type: none"> <li>–Final Design</li> <li>–Final Functional Classification</li> </ul> </li> <li>Basis for Interim Operation Complete</li> <li>Critically Analysis complete Supported by:               <ul style="list-style-type: none"> <li>–Final Design</li> <li>–Draft Vulnerability Assessment Report</li> <li>–Final Functional Classification</li> <li>–Administrative Controls</li> <li>–Final Hazards Analysis</li> <li>–Accident Analysis</li> <li>–Criticality Analysis</li> </ul> </li> <li>Final Shielding Analysis complete Supported by:               <ul style="list-style-type: none"> <li>–Final Design</li> </ul> </li> <li>Fire Hazards Analysis Complete Supported by:               <ul style="list-style-type: none"> <li>–Final Design</li> <li>–Final Functional Classification</li> </ul> </li> <li>Preliminary technical safety req'ts ident.</li> <li>Prelim Documented Safety Analysis / Prelim Safety Analysis Report complete Supported by:               <ul style="list-style-type: none"> <li>–Emergency Action Levels</li> </ul> </li> </ul>	<b>Technical:</b>  <b>Maturity:</b> <ul style="list-style-type: none"> <li>All as-builts complete</li> <li>Performance Verification               <ul style="list-style-type: none"> <li>a) Operating Parameters Definitions</li> <li>b) Process Optimization</li> </ul> </li> <li>ORR Planning and Preparations complete</li> <li>Construction Punch List</li> <li>All test plans issued and testing complete</li> </ul> <b>Safety and Hazard Analysis/ Vulnerability Assessments</b> <ul style="list-style-type: none"> <li>Emergency Preparedness Hazard Assessment</li> <li>Final Fire Hazard Analysis complete Supported by:               <ul style="list-style-type: none"> <li>–Final Drawings</li> <li>–Walk-down</li> <li>–Tests</li> </ul> </li> <li>Documented Safety Analysis/ Final Safety Analysis Report Supported by:               <ul style="list-style-type: none"> <li>–As-builts</li> <li>–Final Hazards Assessment</li> <li>–Startup test results</li> <li>–Site Safeguards and Security Plan</li> <li>–Safeguards and Security Management Report</li> <li>–Final Vulnerability Assessment Report</li> <li>–Tests (force on force)</li> </ul> </li> <li>Technical Safety Requirements complete Supported by:               <ul style="list-style-type: none"> <li>–Documented Safety Analysis/Final Safety Analysis Report</li> </ul> </li> </ul>

**Project Documentation by Typical Phase (Execution – Transition/Closeout)**